March 1985
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80micro

A CWC/I PUBLICATION

the magazine for TRS-80* users

Those #*$& Messages!

A Beginner's Guide To Causes and Cures

The Model 4 Sort That Tandy Forgot

Tandy's 1200 HD: The Price Is Right

Is Your Micro Tax Deductible?

Also:
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BBS Express
Basic Takes
2000 Plus

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Note: Not for use with "The Home Accountant."

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80 formats its program listings to run 64-characters wide, the way they look on your video screen. This accounts for the occasional wrap-around you will notice in our program listings. Don't let it throw you, particularly when entering assembly listings.

Article submissions from our readers are welcomed and encouraged. Inquiries should be addressed to: Submissions Editor, 80 Pine Street, Peterborough, NH 03458. Include an SASE for a copy of "How to Write for *80 Micro*." Payment for accepted articles is made at a rate of approximately $50 per printed page; all rights are purchased.

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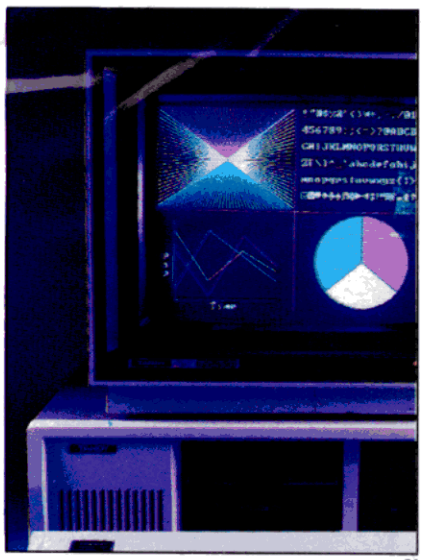
March 1985 **80micro**



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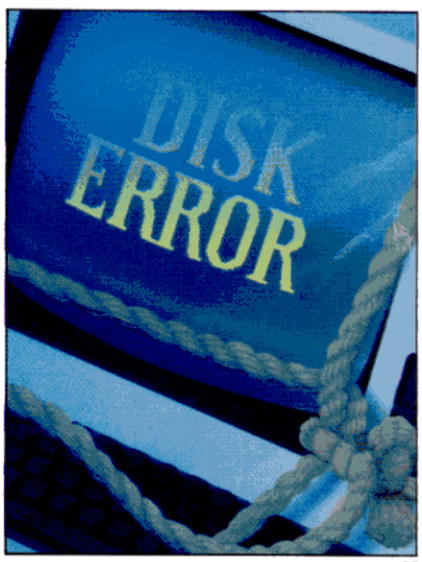

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How to fathom disk error messages and salvage flawed disks. (Models III and 4)

70. A Sort Story *by Alan D. Smith*
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74. Reasonable Deductions
by Robert C. Lake, Mary R. Golden, and Samuel L. Lett
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44. Grade-A Graphics *by Michael Leibow*
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58. A La CRT *by Ken Schweim*
A better way to cook up menu-driven programs. (Models I and III; Load 80)

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LOAD 80

Load 80 gathers together selected programs from this issue of *80 Micro* and puts them on a magnetic medium for your convenience. It is available on tape or disk, and runs on the Models I, III, and 4.

Load 80 programs are ready to run, and can save you hours of time typing in and debugging listings. Load 80 also gives you access to Assembly-language programs if you don't have an editor/assembler. And, it helps you build a substantial software library.

Using Load 80 is simple. If you own a tape system, load the Load 80 tape as per the instructions provided. If you own a Model I or III disk system, you boot the Load 80 disk and transfer the files to a TRSDOS system disk according to simple on-screen directions. If you own a Model 4, you must convert the programs from Model III TRSDOS to Model 4 disk using the Model 4 CONV command.

Not all programs will run on your system. Some Model III programs, for instance, will run on the Model 4 in the Model III mode, but not in the Model 4 mode. You should check the key box that accompanies the article to find out what system configuration individual programs require.

If you have any questions about the programs, call Keith Johnson at 603-924-9471. Yearly subscriptions to Load 80 are $199.97 for disk, or $99.97 for cassette. Individual loaders are available on disk for $21.47 or on cassette for $11.47, including postage. To place a subscription order, or to ask questions about your subscription, please call us toll free at 1-800-645-9559 between 9 a.m. and 5 p.m. Or, you can write to *80 Micro*, Subscription Department, P.O. Box 981, Farmingdale, NY 11737.

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System: Model III, 48K RAM, one disk drive
Language: Assembly/Disk Basic
This versatile graphics generator won grand prize in *80 Micro*'s 1984 Young Programmer's Contest.
Cassette filespec: GRAPH, B, C, D, LOAD, SAVE, DSPLAY
Disk filespec: GRAPH/CMD (object code), UTIL1/BAS, UTIL2/BAS, UTIL3/BAS, LOAD/CMD (object code), SAVE/CMD (object code), DSPLAY/CMD (object code)

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Language: Basic
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This module gets your bulletin board up and running.
Cassette filespec: S
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Language: Disk Basic
A help file generator program.
Cassette filespec: T
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Alien Shuffle
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Language: Disk Basic
Try to rearrange these aliens into peer groups.
Cassette filespec: U
Disk filespec: ALIEN/BAS

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Considered Opinions: *80*'s Readers Speak Out

I'm always impressed by the numerous constructive and intelligent comments we receive on our reader surveys. So I'm going to dedicate this month's Side Tracks to some of the remarks we got on our most recent survey, and try to address a few of the most frequent complaints.

"80 Micro *is becoming fragmented by trying to cover all of Tandy's computers.*"

Five years ago, covering TRS-80s was simple—the Model I was pretty much all we had to worry about. Tandy now has more systems than we can fit in one room. Our dilemma is how to cover as many bases, and satisfy as many readers, as possible.

For a while, we tried to provide some coverage for nearly all the TRS-80s. We realized, however, that to do so was to cheat the core of our readership—owners of Model I's, III's, and 4's. So about a year ago, we made some painful but necessary decisions to end coverage of certain systems, including the Color Computer, Model 100, and Models II/12/16. These micros are, we felt, too incompatible with the I/III/4 family to be covered adequately in the same magazine.

The result is that we've lost a certain number of subscribers. But we feel it's better to satisfy most of our readers than none at all. The I, III, and 4 are our bread and butter, and we're committed to covering them as well as we can.

As for the Model 1000, we'll watch its performance closely in 1985, and evaluate whether we can cover it without compromising our I/III/4 coverage.

"You seem to be reducing to next to nothing your support of Model I systems."

The Model I is a great old machine, and its users are among microcomputing's most diehard. Model I owners still make up nearly one-third of our readership. We'll therefore ensure that as many of our programs as possible run on the Model I.

We recognize, however, that Model I owners are abandoning their machines for Model 4's and MS-DOS systems. Consequently, the number of Model I users among our readership is declining rapidly. They now rank third behind the Models 4/4P and III owners. Simple math tells us that we must give the bulk of our coverage to the latter two machines.

"It's not business-oriented; it seems to be hobby-oriented."

"It's moving too much toward business and away from hobby."

We seem to have a difference of opinion here.

Much depends, of course, on your perspective. New readers who own Model 4's are more likely to want business programs, while I/III users tend to want home/hobby programs.

We still have more hobbyists than businessmen. Our survey shows that personal and hobby use out-polls business use by 64 to 51 percent. Some 81 percent of our readers use their micros at home, while 57 percent use one at work.

The upshot is that *80 Micro* will continue to focus on home and personal uses. We recognize, however, the growing number of TRS-80s in business, and will try to provide more applications for those machines.

"Games—YUK."

There was a time when our August games issue outsold all others. Alas, no more—games are now at the bottom of our readers' want lists. This will translate into fewer games and an end to the annual games issue. We have, however, scheduled several Basic games that demonstrate interesting programming techniques, and we will also include some games on Load 80 as bonuses.

"Getting too small. Fear it may fold. Please don't!!"

It's natural that some people equate size with health. Actually, *80 Micro* is in better shape than it ever was. Do you have any idea how much it cost to print and mail those 3-pound suckers?

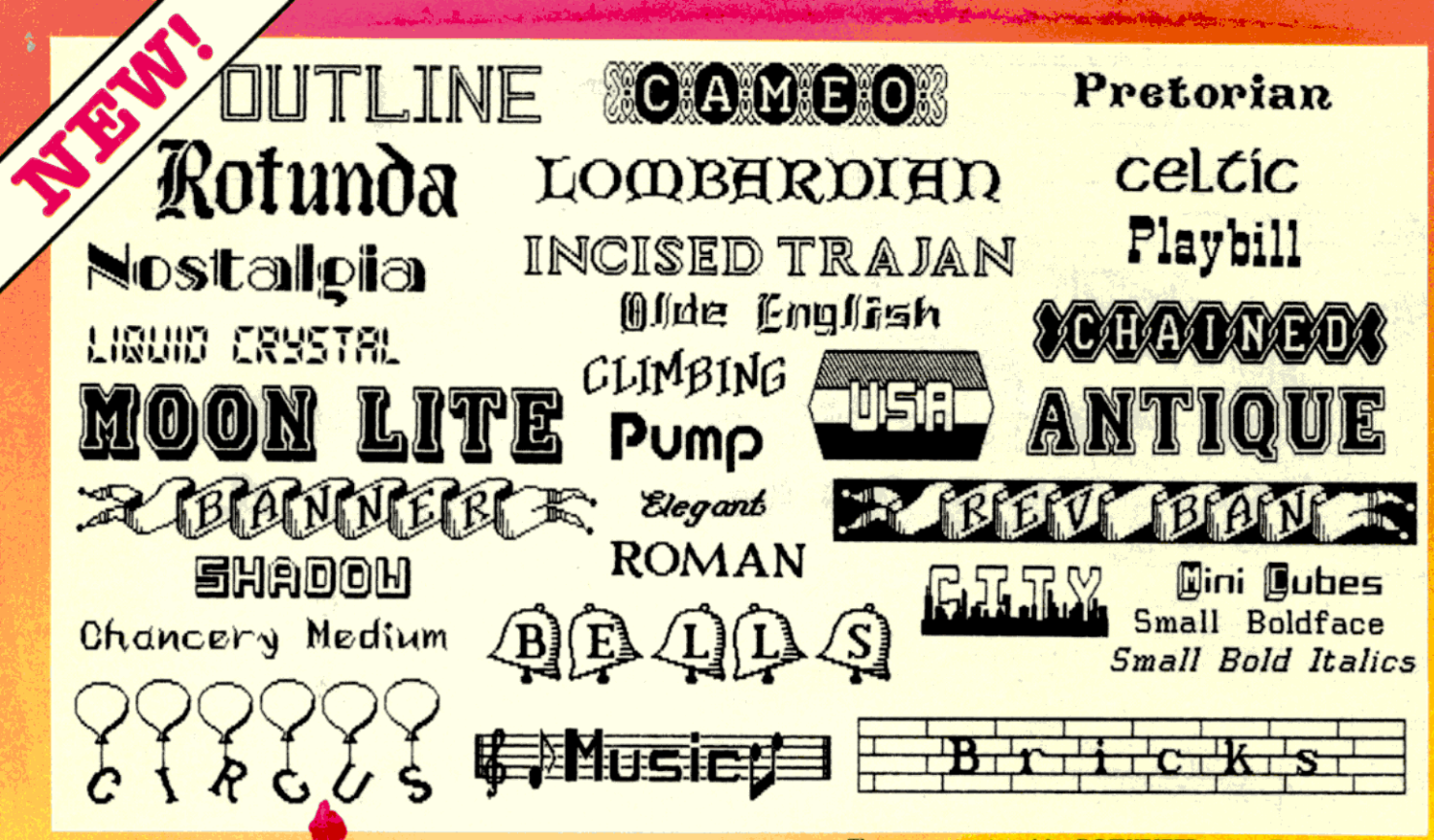
The reduced size of the magazine is directly related to the enormous shakeout in the TRS-80 third-party market. Fewer companies mean fewer ads, which mean fewer pages.

Keep in mind that the TRS-80 market and *80 Micro* are much more mature than other markets and magazines. We've gone through the initial explosion, and are now stabilizing. Don't be jealous of those who own other, seemingly more glamourous, systems. They'll eventually be in the same boat.

In the meantime, rest assured that *80 Micro* is here to stay.

"Many programs published by readers are so full of bugs that they become useless."

Our tech staff checks each program several times before it goes into the magazine, and the result has been a significant reduction in the number of bugs. Nevertheless, we recognize that still too many slip through, so we're revamping our tech-check system. We'll not only be looking for syntax and typographical errors, but for errors in logic that pop up only after a program has been used for a while. We'll never be perfect, but we promise to do better in the future. ■



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These were printed by DOTWRITER on an Epson MX-80.

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80 readers' choice micro 1983

If you want to create your own logos, modify our typefaces, or even design entirely new typefaces, then you will also want to order the "Letterset Design System" (LDS). We offer LDS at half-price when you order it along with DOTWRITER. LDS operates in Model III mode on the Model 4.

Versions are available for Epson MX-80 with Graftrax, MX-100 with Graftrax-Plus, RX-80, FX-80, C. ITOH 8510/1550, Microline 84/92/93; Radio Shack's DMP series 200–2100, CGP-220 & Gemini 10X, 15X. Please specify printer and computer!

Our print samples were done on an Epson. Sizes vary on other printers. Some of the samples shown here are taken from the additional Letterset disks.

Two disk drives and at least 48K of memory are required. LDS is not available in native Model 4 mode.

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In an attempt to push the public into expensive 16-bit computers, many manufacturers have been saying that the TRS-80 is obsolete. The truth is that the software, not the hardware, makes the difference. And the best word processor of all is now available *only* on the humble TRS-80, not on those expensive 16-bit machines!

ALLWRITE is based on the proven methods that made NEWSCRIPT the most popular independently produced TRS-80 word processor, but it also has the speed and new features our customers have asked us for. ALLWRITE will save you time and let you produce the highest-quality, most professional-looking letters, term papers, and reports available on a micro-computer.

Allwrite Can Save You Time!

Reads a 25,000 character file (10 printed pages) from disk in SIX SECONDS...does a global search-and-replace in FOUR SECONDS...outruns even the fastest popular micro-printer.

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You can set and change on-screen tabs and store them on disk. The print-time tabbing features are incredibly versatile: they allow left, right, and centered tabs, and even line up your decimal points.

ALLWRITE shows you where you forgot to turn off underlining, boldface, italics, or double-width. Special on-screen Preview feature shows page breaks and page layouts...including underlining and boldface ...without annoying blinking or screen flicker. In "Summary" mode, ALLWRITE quickly flags formatting errors without wasting time printing all the text. These standard features make document preparation faster and easier than ever!

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There is no upper-limit on document size with ALLWRITE, because it chains files *backwards* as well as forwards, even across diskettes. Switch from one chained file to another in less than six seconds by pressing two keys. Select portions of other files for inclusion at print time...great for stock paragraphs.

ALLWRITE salvages text from bad disks! If a sector goes bad, you won't lose the entire file, because it will skip bad sectors, **read the rest of the file,**

TAKES FULL ADVANTAGE OF YOUR MODEL 4.

The model 4 version of ALLWRITE uses **the entire 80-by-24 screen.** On a 64K machine, you can edit **over 34,000 characters** of text. On a 128K machine, you can edit **THREE FILES AT THE SAME TIME!** The second and third files can be over 32,600 characters each, for a total of **almost 100,000 characters** of text in memory.

and then show you where the lost text belongs. This advanced error recovery turns a disaster into a feeling of profound relief.

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You can store **22 phrases or commands at a time into "soft-keys,"** then press just two keys to retrieve them. This makes frequently-used phrases and formatting controls *a snap to use*. You can store these definitions on disk and build a library of hundreds of preprogrammed keys to fit every one of your applications.

Our specially-designed templates fit right on your keyboard to let you see your settings at all times. Each template is also a Reference ("Cue") Card, so it is always right in front of you when you need it, without using up valuable screen space.

ALLWRITE Is Easy To Learn

ALLWRITE's commands and control keys are easy to remember because they use the first letters of common English words: 'CE' stands for 'Center,' 'Search' and 'Replace' do just that, and so forth. The **on-line HELP menu** offers over fifty screens of topics.

NEWSCRIPT's documentation was acclaimed in every review, and ALLWRITE's 350-page book is even better. Portions of it are designed for beginners, with every feature clearly explained in step-by-step tutorial style. Since you won't always be a beginner, other parts of the book offer advanced topics. There is a cross-reference summary chapter, a 14-page comprehensive index, and a detailed Table of Contents. We've been developing computer programs and manuals for over 20 years, and understand the importance of good documentation.

To make installation easy, we include Tiny DOSPLUS for the Models I and III, and special, pre-tailored versions of **both** TRSDOS 6.2 **and** DOSPLUS IV for the Model 4, all at no extra charge. The Model I and III versions work equally well with all major DOS's.

PROSOFT'S On-Going Customer Support

Perhaps the best reason of all for having ALLWRITE is the continuing support we offer you: friendly, expert, direct support that is unsurpassed in the micro-computer industry. There is no time limit to our support: if you are our customer and you need help, just call or write. We give free updates for 90 days, and charge little or nothing for minor updates thereafter.

Customer Comments

"This is the best software package I have ever received . . . superb, easy to use, fast, and has more features than the business word-processor at the office." *(E.R.L.)*

"ALLWRITE is a professional system that sets a new standard in word processing. It's powerful and easy to learn and use."

80 MICRO, Nov., 1984

"Your company and products have to be one of the strongest factors I can think of for keeping me with the TRS-80!" *(J.R.H.)*

"NEWSCRIPT is the Cadillac of word processors. ALLWRITE is the Mercedes Benz!!" *(B.E.)*

". . . a very readable manual." *(D.S.)*

BENEFITS OF OWNING ★ ★ ALLWRITE ★ ★

If Word Processing is important to you, PROSOFT's ALLWRITE is the best choice you can make. The clean, professional appearance it adds to your letters and reports will make an excellent impression on people. We will be happy to send you free print samples so that you can see for yourself how good ALLWRITE will make you look.

You probably know that quality word processors for CP/M and the IBM-PC sell for $300–500, and they don't have ALLWRITE's capabilities or speed . . . or PROSOFT's proven, on-going support. Now, for a fraction of the cost of a new computer, you can have the most complete word processor of all. And you won't have the headaches of starting all over again with a new, different computer.

Note to college students: with its Footnote, Table of Contents and Index features, ALLWRITE is ideal for your reports and Term papers.

Circle 30 on Reader Service card.

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T/Maker Talks

Eric Grevstad's review of T/Maker (January 1985, p. 34) is somewhat misleading. First, Grevstad seems overly influenced by what he assumes to be the correct method of implementing features. We at T/Maker feel that it's more useful to rate software according to its ease of use and efficiency. T/Maker software exhibits useful features that are easy to use; we'll let other companies specialize in features and functions their customers will never use.

The slow screen response and the keyboard bounce are problems attributable to the particular screen implementation Digital Research chose for CP/M Plus. T/Maker's word processor, for instance, running on the Models 4 and 4P under TRSDOS, behaves quite differently. The TRSDOS version is currently selling at $299.

Where value and usefulness are concerned, T/Maker is an excellent alternative to purchasing three or four separate programs.

Royal Farros
Marketing Director
T/Maker Co.
Mountain View, CA

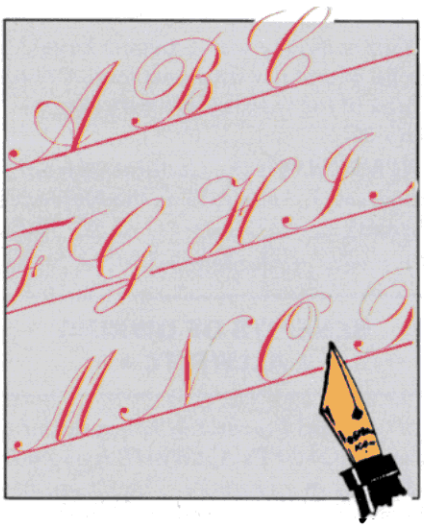
I Protest

I protest the exclusion of Model I programs from *80 Micro*'s annual Young Programmers Contest. I'm well aware that support for the Model I is rapidly decreasing. However, I urge you to remember your roots and let the Model I die a slow and natural death without encouragement from *80 Micro*.

R. Don Robinson
Hobbs, NM

Demanding Pascal

The Alcor Pascal compiler is efficient and takes full advantage of Models III and 4 capabilities, including the Model 4's optional second 64K RAM bank. The two-stage compiler lets you



compile your Pascal program into p-code that's then translated into machine instruction for execution directly by the hardware features of the Models III and 4.

Alcor Pascal, in my opinion, includes what most programmers want in a computer language. Unfortunately, however, it doesn't support the high-resolution graphics board option. It's up to us to try to convince Tandy/Radio Shack that a graphics enhancement for the Alcor Pascal compiler would be a popular software package.

David A. Smith
Berkeley Heights, NJ

Reference Point

I'd like to clarify a few of John B. Harrell III's criticisms in his review of Nanos Systems' CP/M Reference Card (October 1984 p. 187). Harrell states that the card doesn't specifically address Radio Shack's version of CP/M Plus. The reason for this is that Radio Shack's CP/M Plus is actually CP/M 3.0, a vastly upgraded version of CP/M 2.2.

Unfortunately, the differences between the two versions are so extensive that it would be foolish to include both on the same reference card. Many commands that are built into CP/M 2.2 are transient programs in CP/M 3.0, complete with different command syntax, in addition to new utilities and commands. For this reason, the card states that it applies exclusively to CP/M-80 1.3, 1.4, 2.2, MP/M, and CP/M-86.

Harrell's comments regarding the missing ASM parameter lead me to believe that he accidentally compared Nanos Systems' CP/M Reference Card to CP/M Plus instead of CP/M 2.2. This parameter doesn't exist in CP/M-80. The PRN file is the Assembly listing file; when printing, you use the PIP utility to send this from disk to your printer. CP/M-86 does have a printer parameter for ASM86 which is listed on the reference card.

Despite these two problems, Harrell's review is accurate and helpful.

Terry Kepner
Co-author of the
CP/M Reference Card
Peterborough, NH

A-B-SEE Congrats

Based on Gary Ludwick's review of A-B-SEE (August 1984, p. 34), I recently purchased the most powerful piece of software ever written for the Model III. Among A-B-SEE's many outstanding features is its ability to enter any of the 256 ASCII characters from the keyboard. In addition, A-B-SEE lets you change the contents of a Do file without having to reenter it. A-B-SEE is also great for making global changes to Basic as it lets you specify whether or not each occurence of a string or variable is to be altered.

Fortunately for Model III users, Computents Inc. still recognizes a healthy market for high-quality TRS-80 products.

John M. Taylor
Wetumpka, AL

Send correspondence to Input, c/o 80 Micro *, 80 Pine St., Peterborough, NH 03458.*

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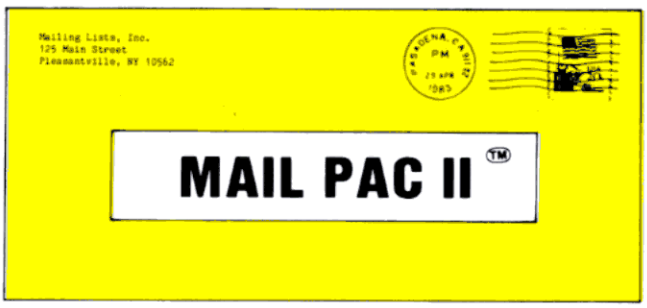

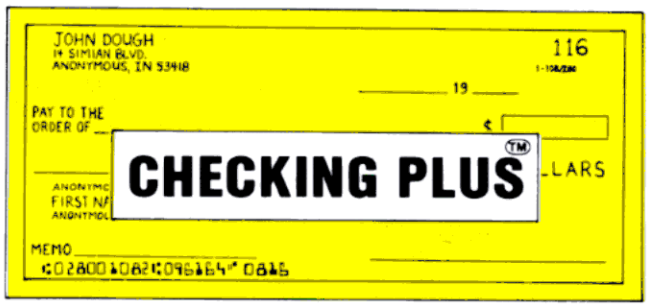

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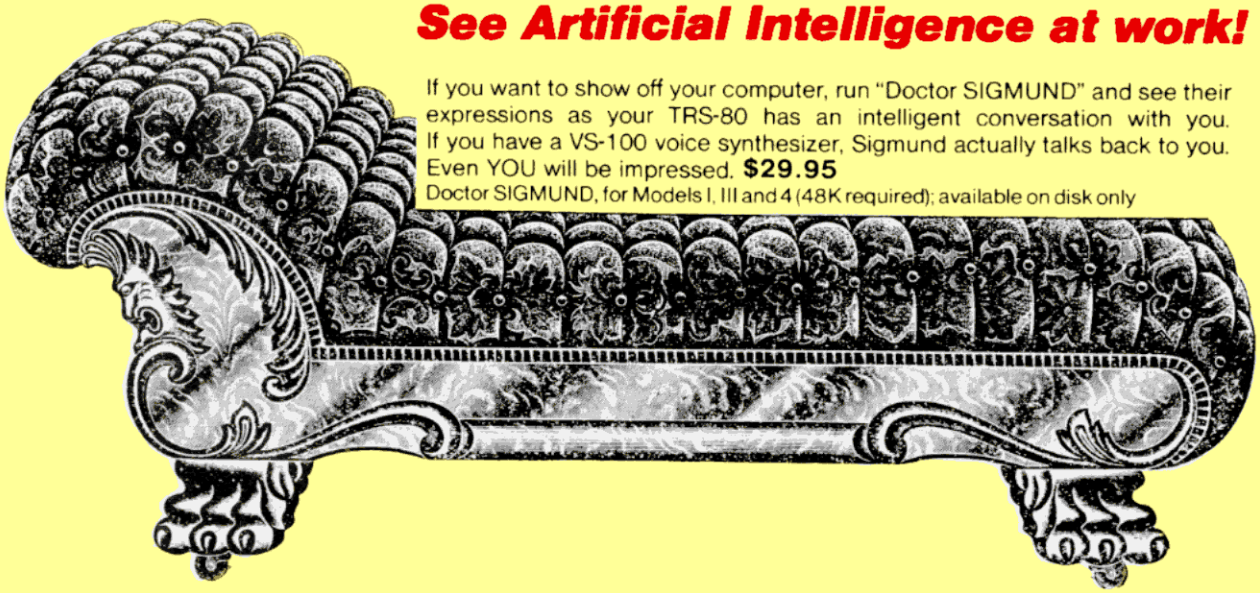

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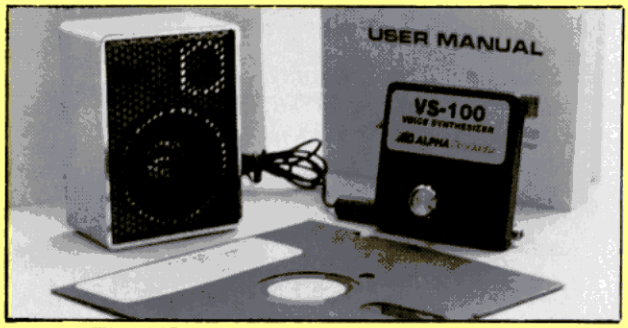
- ☐ Walks the dog.
- ☑ Many control codes to tailor the system to your wishes. (Pitch, speed, etc.)
- ☑ Only 6¼K long.
- ☑ Talker relocates itself into available high memory. Compatible with any DOS (not CPM).

The VS-100 hardware:

- ☑ Same performance as very expensive units.
- ☑ Super efficient: About 50 bytes per sentence.
- ☑ Handsome speaker module included.
- ☑ Detailed 48 page manual.
- ☑ Ready to plug in and talk right away.
- ☑ Uses the famous Votrax SC-01 with 4 pitch levels and automatic inflection.
- ☑ Built in audio amplifier with volume control.

See the detailed review in 80-Micro December 1984.

Easy to use?	★★★★★
Good docs?	★★★★½
Bug free?	★★★★☆
Does the job?	★★★★★



The VS-100 system. (Model I shown)

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Includes:
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- Speaker
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- Manual

Specify Model I, III, 4 or 4P.

Model 4P needs short 50 pin extension cable 14.95

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Small Print: ● Model I: unit plugs into keyboard or expansion interface 40 pin bus. ● Model III,4,4P: unit plugs into 50-pin I/O bus. Model III VS-100 works with Model III,4,4P. Use our "Y-cables" (see next page) if your bus is already used.

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80-Micro *(December 1984).*

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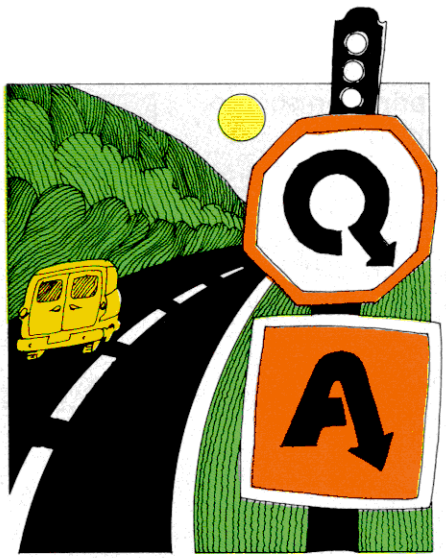


Q: I have a Model III with three disk drives. Drive 1 reads only disks formatted and backed up in that drive; with other disks, I get a CRC error. I get the same error message if I try to use a drive 1 back-up in another drive. What is a CRC error and how does it affect my system? *(Mac Olsen, Kamloops, BC, Canada)*

A: The problem is definitely with the drive's alignment. The drive head has drifted from its proper position so that it no longer sits directly over the disk tracks. The CRC (cyclic redundancy check) error refers to a special checksum maintained on every disk sector. If the computer gets a checksum different from the one on the sector, you get a CRC error.

The fact that disks backed up in drive 1 are the only ones that work proves head alignment is the problem. The drive head wrote the disk to match its own misaligned format. This means that after you have the drive head realigned, disks written by drive 1 will give CRC errors.

Also, you should make sure that the drive head is securely in place: If it's loose and drifts in and out of alignment, it's difficult for a technician to pinpoint your alignment problem.

Q: Until recently, I've used a Model 16B in Model II mode to run Microsoft Basic programs under the CP/M operating system. I switched over to Xenix and find that the same programs run slower than they did under CP/M: It takes up to five times longer to load a data file in Xenix M-Basic. Could you explain why this is so?

Second, is there some way to bypass Xenix's built-in print spooler? Xenix forces all printer output to spool to the hard disk before it goes to the printer. This slows down output tremendously. It also prohibits my using LPRINT or LLIST statements in MBasic.

Finally, the print spooler won't accept more than three output files from a program. If I try to send a fourth output file, the program stops executing. *(Craig C. Stephan, Westchester, IL)*

A: Xenix's optimum configuration is 2.5 megabytes of RAM with 60 megabytes of hard disk storage. With smaller amounts of RAM, Xenix slows down, becoming almost useless on a 512K system. This is because Xenix itself requires almost 1 megabyte of RAM and uses a special memory swap area to load and use special modules for purposes like loading disk file data into Basic. If Xenix lacks sufficient RAM space, it must store these modules on disk, loading them as it needs them.

At 512K, Xenix spends a lot of time swapping modules into RAM, slowing everything down considerably. Basic exacerbates the situation by grabbing memory away from Xenix. The only solution is to buy more memory and give Xenix some breathing room in your computer.

The printer spooler is necessary because Xenix is a multiuser system, and direct printing might interrupt another job in progress. Xenix requires that you open and name a disk file before you print. The LLIST and LPRINT commands, when used directly, don't have file names, which causes errors. However, you can link Basic to the printer so that LPRINT goes immediately to the printer when it arrives in the spooler. To do so, use the CAT command and Pipe option like this: CAT file name.doc (PIPE symbol) LTR. The LPRINT statement still sends data to the spooler file on disk, but you don't see it.

You can have up to 15 output files in M-Basic, with three automatically buffered when you enter Basic. If you want more output files, you have to open buffers for them. Maybe you haven't properly opened additional buffers; I suggest you reread your manual's instructions.

Q: When I use my Model I for long periods of time, it gets very hot and the keyboard freezes up. I tried using a small fan behind the computer but that doesn't help. Do you know what the problem might be, and what I can do about it? *(Paul Strasser, Mayfield Heights, OH)*

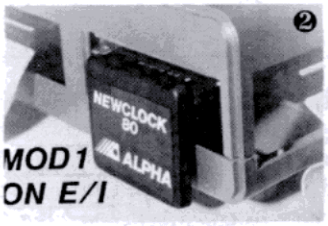
A: You don't say if you're using an expansion interface (EI). If you are, remove both of the interface's power supply units and place them behind the interface.

Also, cleaning your computer might help. Get a vacuum cleaner and thoroughly go over the keyboard and the EI, as dust could be shorting out some of the circuits.

Another possibility is that the keyboard unit's on-board power supply is beginning to give out. My advice is to take the computer to Radio Shack for repair.

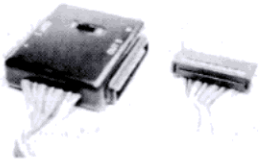
Q: I'd like to use my Model 4P and DMP-110 printer at sporting events held off the beaten

Newclock-80 $69.95



The right time at the right price! Keep the time and date with quartz accuracy, even when your computer is off. The backup lithium battery (included) will last for over 2 years. Software on tape or disk, please specify. Use "TIMESET" once to set the clock. Use "SETCLK" to set your computer's internal clock (at power up) or use "TSTRING" so that the "TIME$" function reads the Newclock.
Connection: Model I: plugs into the keyboard or expansion interface. Model III: plugs into the 50-pin I/O bus. Compatible with all operating systems.

Printswitch $59.00

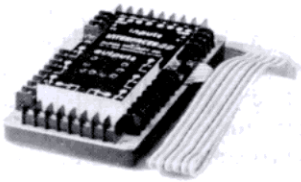


Do you have 2 printers? Get a Printswitch. Stop plugging and unplugging those printer cables. With the Printswitch, you can have 2 printers connected to your computer and you can select either one at the flick of a switch. Works with any printer, plotter, or device that uses the parallel printer port. Simply plug the 14 inch Printswitch cable into your computer, and plug your existing printer cables into the Printswitch. This is the nicest unit on the market. Superior quality board with gold plated edge connectors. For Models I,III, 4 and 4P.

Alpha Joystick $27.95

When it's time for fun, don't be without your Alpha Joystick. Do you know that most action games are Joystick compatible? Stop pounding on your keyboard and enjoy real arcade control. The joystick can also be used with BASIC programs; simply do J=INP(0) to read the joystick position (8 directions and fire button). Model I: plugs into keyboard or expansion interface. Model III, 4 and 4P: plugs into 50-pin I/O bus. The Alpha Joystick comes fully assembled and tested, ready to plug in and enjoy. (Specify Model I, or Model III,4).

Interfacer-80 $159.00



Low cost input and output device. The outputs consist of **8 relays** (rated 2 Amp @125V), easily controlled using "OUT" commands. For example, OUT 0,0 turns all the relays off. Eight LED's show the states of the relays. The **8 inputs** are optically isolated, so it's safe and easy to connect external devices (switches, sensors, thermostats, etc.). Simple "INP" commands read the inputs.
Connection: Mod I: 40 pin bus. Mod III, 4, 4P: requires 50-pin I/O bus converter ($39.95), plugs into 50-pin I/O bus. Comes complete with power supply, cable, and detailed manual.
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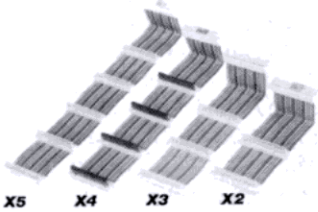
Connection: Model I: 40 pin I/O bus. Model III, 4, 4P: requires 50-pin bus adapter ($39.95). Comes complete with power supply, cable, and manual.

Special Cables



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Y-Cable for Mod I bus (40 pin): • **X2-40**...$29 • **X3-40**...$44 • **X4**...$59 • **X5**..$74
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• For Mod I bus (40-pin)...**C167:**$24 • For Mod 3 & 4 bus (50-pin)...**C169:**$28
Keyboard to E/I (40-pin, 8")...**C161:**$21 If this is confusing, send for our Cable Flyer.
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track, far from reliable power supplies. I've heard that you can run a micro off an automobile battery. Have you any idea how I could do this? *(Mike Meenehan, West Lafayette, IN)*

A: What you want is a 12-volt dc to 120-volt ac solid-state converter. Make sure the unit you buy is rated for the current drain that the computer and printer impose.

Q: I have a Model I with 16K and an interface. I'd like some guidelines for installing more memory (16–32K) myself. I've noticed 16 empty integrated circuit (IC) sockets under the interface and assume they're for 32K of extra RAM. If I'm right, what type of RAM should I use? *(Chris Miller, Larchwood, IA)*

A: Adding memory to the expansion interface is easy. First, clear a work area on a table, with a sheet or newspaper on top to protect the table's finish. Make sure you disconnect the expansion interface from power supplies and from the computer keyboard.

Turn the computer over and remove its bottom case. This exposes the interface's circuitry and chips. Notice that the 16 empty sockets are in two rows, with a notch at one end of each socket. A silk-screened outline of an IC appears below each socket, and a silk-screened notch appears below each socket's notch.

Use 4116 RAM chips with a speed rating of 200–350 nanoseconds. (Radio Shack sells 4116s with a speed of 350 ns.) Carefully pick up each chip by the ends; don't touch the legs, since the static in your hands could damage them. Place the chip in an empty RAM socket, aligning the chip's notch with the socket notch and the silk-screened outline.

If the legs stick out too far, push them in by pressing the chip sideways against the table top. Once the legs are in place, press firmly against the top of the chip until the chip snaps down into the socket. Inspect the chip to make sure its legs are all in the socket and are undamaged. Repeat this procedure with the other chips.

It's a good idea to ask a friend to check your work. Then reassemble the interface, reconnect the power supplies and keyboard, and turn everything on. To test the chips, type in PRINTMEM from Basic—the answer should be about 48,340. If it's 15,572 or 31,956, then one or more chips is defective or improperly positioned, and you'll have to disassemble the interface and inspect the chips again.

If everything looks fine, reassemble the system and use a memory test program to find the bad chips. If you don't have a memory test program, you can use this Basic program to find the bad addresses:

```
10 FOR I = -32767 TO -1 :REM Use the MEM
prompt to protect the memory above 15572

20 POKE I,0 : IF PEEK (I) <> 0 THEN PRINT
I "Bad address"; PEEK (I)"number found"
30 NEXT
```

Since each chip is 1 bit of every 8-bit RAM byte, a number other than zero tells you which chip is bad. Chips Z1–Z8 are addresses 49,152–63,535. Remember, you can't POKE and PEEK over 32,767, so you must use negative numbers to access RAM above 32767; in this case those addresses are −16,384 to −1. Chips Z9–Z16 are addresses 32,768–49,151 (POKE and PEEK addresses −32,768 to −16,383). Z1 and Z9 are bits 7; Z2 and Z10 are bits 6; Z8 and Z16 are bits zero. Therefore, if you get a 3 in the address range −32,767 to −16,384, you need to replace chips Z15 and Z16.

If you don't have the expansion interface's technical manual, you should order one from Radio Shack National Parts (900 E. Northside Drive, Fort Worth, TX 76102).

Don't let all this scare you—I've installed RAM chips many times and only once did I have trouble.

Q: I have a Model II with CP/M 2.2. What programs are available, and where do I find them? *(Rafael Salgado, Los Angeles, CA)*

A: Thousands of programs will operate on your computer with CP/M 2.2. For commercial programs, the primary source is mail order. Lifeboat Associates (1651 Third Avenue, New York, NY 10128) has been in the mail-order software business the longest. Another good source is Montezuma Micro (P.O. Box 32027, Dallas, TX 75232). Montezuma Micro specializes in supporting Radio Shack computers with CP/M software, while Lifeboat serves a more general market.

If you're interested in free software, check out the SIG/M and CP/MUG libraries. The SIG/M library of public domain programs has over 200 disks, each containing an average of about 15 programs. Programs in most languages are available. The CP/MUG library has 92 disks.

A good reference on both libraries is *The Free Software Catalog and Directory* by Robert Froehlich. It's available from Crown Publishers (One Park Avenue, New York, NY 10016) and costs $9.95. It isn't as well organized as I'd like, but it's by far the best source currently available.

I can supply readers with a catalog disk that lists and describes the SIG/M library's programs. To cover my costs, I'm charging $6 for a single-sided 8-inch disk in standard IBM format, $12 for four 5¼-inch disks in Osborne, Omikron, or Xerox format. If enough people are interested, I'll see about supplying the catalog disk in Radio Shack CP/M+ format, too.

To order the catalog, send a check or money order to Terry Kepner, P.O. Box 481, Peterborough, NH 03458. Be sure to specify your format.

I'd like to correct an error that appeared in the December 1984 Feedback Loop. In response to a question from Steve Weeber (p. 18), I said LeScript wasn't designed to operate in the Model 4 TRSDOS 6.X.X environment. That's not true; LeScript has always worked under Model 4 TRSDOS and, in fact, takes advantage of the 4's 80-column by 24-line display.

Steve wanted to know why his computer acted up when he ran LeScript in Model 4 mode. Because he'd just upgraded from a Model III, I assumed his version didn't run under Model 4 TRSDOS. However, LeScript works on the Model III and the 4; Steve should have had no trouble running LeScript under TRSDOS 6.X.X. ■

Terry Kepner is a freelance writer and programmer, and an associate editor of 80 Micro. *He writes monthly columns for* Portable 100 Magazine, Hot CoCo, *and* Under Color. *He's been writing about microcomputers since 1979.*

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80tk DS, Half-High, TEAC FD55-F 239
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How Does The Producer Work?

The Producer itself is a sophisticated program based on years of research and development. But The Producer was written with the end user in mind and the program generation process is quite simple.

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The Producer software package makes learning simple. An easy to follow tutorial takes you through each step of The Producer process as you sit at the computer. (This includes audio cassette tapes with the Model I/III versions.) This hands-on experience not only teaches you the process but allows you to create a program of your own design while you learn. The tutorial is all you need to get started.

Later, if you have need for more specific information, you can turn to the fully indexed Producer Reference Manual. The 200 pages of documentation cover virtually any question you may have so you will never be left guessing what to do next. The Producer package also includes a quick reference card to streamline your program operation and, should you ever need technical assistance, you may call a Producer Software technician for free counsel and trouble shooting.

Is It True That I Can Both Create and Edit At Will With The Producer?

Yes! Unlike most other program generators, The Producer gives you complete freedom to design the screen any way you wish. Experiment, rearrange, "cut and paste" between trial screens. That's the kind of versatility you get. And even after your program is complete, you can change your mind. With The Producer you can edit and refine finished programs without starting over. That's a real time saving.

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Getting Fiscal: Old Trends, New Trends

edited by Bradford N. Dixon

Tandyland

As you might expect, Tandy does a booming business every Christmas, but in recent years its sales curve has flattened out in the December quarter (see the Figure). This year, Tandy has an explanation for the trend: the addition of computers and telephones to its product lines. These products, often aimed at the business or institutional buyer, tend to sell more steadily year-round, as they're usually not bought as gifts.

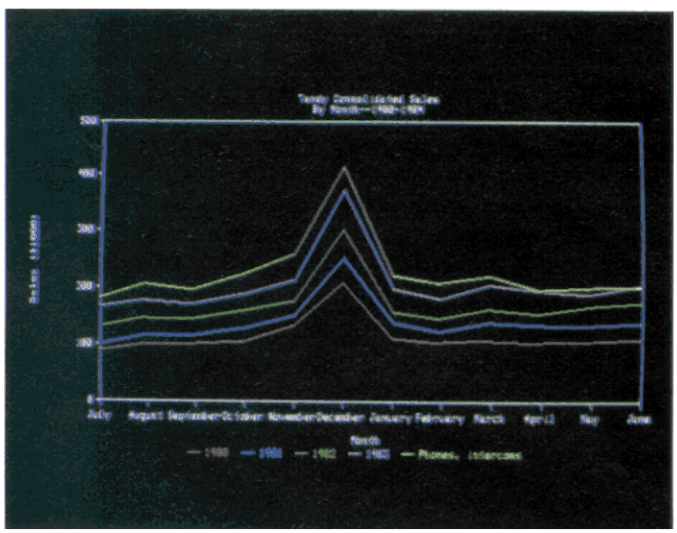

Figure. Tandy's monthly sales since 1980.

Overall, average monthly sales for Radio Shack stores at least a year old increased 6 percent during fiscal 1984, compared to increases of 12 percent in fiscal 1983, 10 percent in 1982, 11 percent in 1981 and 6 percent in 1980.

Tandy's slackening sales continued into fiscal 1985: Radio Shack's first quarter sales were down. The company's computer division is looking to the Color Computer and Tandy's new PC-compatible micros to buoy sales, but it will take more sustained growth to get Radio Shack back into its familiar profit profile.

Tandy doesn't expect strong earnings and sales growth until fiscal 1986, according to a story in the Nov. 9, 1984, *Wall Street Journal*. Tandy's president and chief executive officer John Roach said earnings per share could easily grow during fiscal 1985, but that wouldn't necessarily mean an increase in earnings. That's because Tandy has bought about 12.8 million of its own shares since fiscal 1984.

Tandy blamed price-cutting and competition for its earnings slump in two consecutive quarters; the company sold more computers, but the increase in volume didn't offset earnings lost through lower prices.

The Model 100 is the latest target of Tandy price-slashing. Tandy's advertised Christmas sale prices of $399 (8K) and $599 (24K) are now the 100's regular prices. The arrival of Tandy's new briefcase computer, the Tandy 200, on the scene puts the Model 100's future in doubt.

Tandy's director of market planning, Ed Juge, told *80 Micro* consumer acceptance of the 100 didn't live up to expectations. Juge said the Christmas price cut was a planned promotion that had been in the works since January 1984.

Tandy's first portable computer is still an appealing buy. The newer Model 200 has a larger screen and Multiplan as firmware, but the 24K Model 100 has the same amount of memory and costs $400 less.

Tandy's setting up a training ground in New York for users of its 1200 HD IBM-compatible computer. Digital Controls Inc. of Norcross, GA, has the job of establishing the experimental learning center.

Dick Cain, Tandy's director of computer training, told *ComputerWorld*, "We have trained 200,000 consumers in the last year. We're not fooling ourselves that standup training is the only way to do it. Digital Controls is an enhancement of our programs."

Digital Controls uses a training system that interfaces a laser disk system with a video monitor hooked into the Tandy 1200. Initially, the course costs $50.

The Tandy 1200 program will use Digital Controls' already developed IBM PC courseware, supplemented with training in seven business programs, including Lotus 1-2-3, MultiMate, Multiplan, Wordstar, and dBase II. Now that Tandy sells Framework and Symphony through Radio Shack Computer Centers, Digital Controls will develop programs for those products as well. Training time for the packages varies from two to twelve hours.

MicroTrends

Backers of micro networking continue to battle it out with multiuser system advocates for the hearts and minds of the business computer buyer. At the Data Processing Management Association's annual meeting last November, Tandy's John Roach helped make the case for networking.

Roach, quoted in *ComputerWorld*, said that although multiuser systems have their advantages, microcomputer

makers are adding features such as graphics that make micro networks more appealing. "Dumb terminals don't support graphics, " said Roach, "and users are beginning to expect graphics oriented systems."

According to Roach, price is becoming less of a factor in the choice between networks and multiuser systems. "The cost of microcomputers is approaching the cost of dumb terminals. That will reduce the multiuser advantage."

Tandy, of course, has a stake in the acceptance of micros as an alternative to dumb terminals. Roach advised data processing managers not to wait for the perfect system, but to look for a system that can be expanded to integrate new technologies as they emerge.

What are business users running on their multiuser systems? Data bases, according to Van Chandler, Tandy's director of computer and software merchandising.

Chandler, in an article in November's *Software News*, said, "Few people have recognized how fast the Unix and multiuser marketplace is growing.... We sell well over 75 percent of Xenix systems [Model 16B] with data bases. Less than half of these also purchase word processing."

According to Chandler, data base sales have increased five times over what they were a year ago, and multiuser systems account for most of these sales at Radio Shack Computer Centers.

Chandler sees "not much awareness" by software developers of the growing demand for multiuser micro data base management systems. He says easy access and easy screen modification are more important in this market than special program features.

The computer magazine market isn't exactly robust just now, but that's not stopping Lotus Development Corp. from launching a new kind of computer journal: a monthly software magazine for Lotus 1-2-3 and Symphony users.

The magazine, called *Lotus*, is scheduled to debut this May. For six months, Lotus will offer the magazine free to 300,000 Lotus customers; after that, the annual subscription rate is $18.

Although Tandy has already indicated it will support MS-Windows, it might also support Gem.

Tandy computer owners who use Lotus software won't find *Lotus* at their local Radio Shack Computer Center because Tandy doesn't distribute other companies' products without sales agreements. The magazine will be distributed through other computer retailers and by subscription.

The number of computer specialty stores could double by the end of the decade, according to Future Computing. Right now, about 3,700 U.S. retailers, including 475 Radio Shack Computer Centers, specialize in computers. In a report titled "Computer Stores, USA," Future Computing predicts that number will rise to 7,200 by 1989.

Almost half of the nation's computer stores are located in the 21 largest metropolitan areas. In those 21 markets, 41 percent of the stores are independents, 23 percent are franchises, 21 percent are manufacturer-owned chains, and 14 percent company-owned.

Radio Shack Computer Centers rank second in number of outlets, behind Computerland's 509 stores. But the report notes that Tandy's 675 Radio Shack electronics stores also carry Radio Shack computers. The Table lists the top 10 computer store chains.

Chain	Number of Outlets
Computerland	509
Radio Shack Computer Center	475*
Entre Computer Center	151
Valcom Computer Center	108
Team Electronics	84
IBM Product Center	83
Heathkit Electronic Center	65
Sears Business Systems Center	60
Control Data Business Center	60
MicroAge Computer Store	53

* Radio Shack also has 675 electronics stores that carry its computer line.

Table. Top 10 computer store chains.

Way back in June 1984, Microsoft Corp. said its MS-Windows program would be released by the end of August. August came and went, and Microsoft moved the release date back to mid-November. In mid-October, *80 Micro* got word that MS-Windows would once again miss its target date and that the product may not be on the shelves or in applications from other vendors until June 1985.

Granted, MS-Windows is an ambitious project, originally described as a graphics-rich universal operating environment using pull-down menus, rubberbanding, and animation. But it's hard to keep up high expectations about a product whose release is delayed time and time again, even after promised introduction dates.

Update

Microsoft and Digital Research, old rivals in the operating system game, are eyeball-to-eyeball once again. Digital's new Gem environment could pose a direct challenge to Microsoft's long-time-no-see Windows program. Gem (graphics environment manager) is a Macintosh-like windowing program due for release in the first quarter of 1985.

Although Tandy has already indicated it will support MS-Windows, it might also support Gem for its MS-DOS computers, according to Ed Juge.

Digital Research says Gem software will run on any MS-DOS based machine equipped with 256K of RAM, two disk drives, a bit-mapped display, a mouse, and MS-DOS 2.0 or a later version. Digital expects all existing MS-DOS software to run under the Gem operating system.

Just what we all need: more software. According to a survey of exhibitors planning to attend the March Info/Software 85 show in Chicago, more software will be introduced in 1985 than in 1983 or 1984.

Thirteen percent of the companies responding to the survey said they'll release substantially more software in 1985 than in the previous two years. Fifty-three percent said they'll introduce "somewhat more" software. Twenty-eight percent plan no increase, while six percent said they'll introduce fewer programs this year. ■

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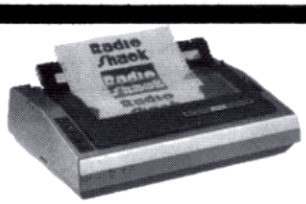
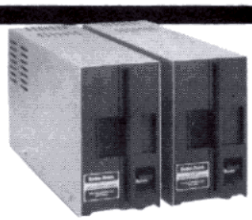


DMP120 $385



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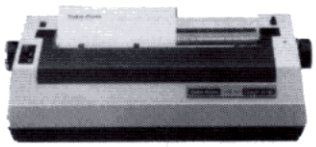

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Taxan Color 420	425
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Radio Shack DC Modem II	160
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Wanted: Model 1000 Patches and Tips

In our June 1985 issue, we will publish a feature article detailing patches and hints for the Model 1000. If you have an idea you'd like to submit for possible publication, put it on the Tandy 1000 SIG of 80 Micro's bulletin board (603-924-6985). The UART parameters are 300 baud, 7-bit words, 1 stop bit, and even parity. Alternatively, you can send your ideas to Dave Rowell, 80 Micro, 80 Pine St., Peterborough, NH 03458. We will pay $25 for each one published.

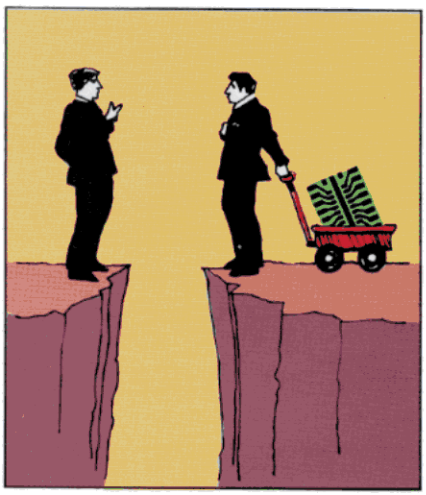
Project 80

Roger C. Alford's hardware column, Project 80, does not appear in this issue. We will publish his two-part CMOS single-board computer project in its entirety next month.

Color Coordination

I have a Model 2000 with the high-resolution color monitor and graphics chip kit. I've read that the Model 2000 screen display is slow when using Basic. One solution is to hit the F12 key during the keyboard scan when you boot up your system. This method, however, inhibits your graphics capabilities. Here's an alternate that gives you both the fast screen display and graphics: First, boot up your system, call Basic, and then hit the F10 key (screen 0,0,0). This puts the computer in the text mode with color disabled. If you want graphics capabilities, use the correct screen command and then return to your text with the F10 key.

Richard R. Hensel
542 Adams Lane
Delaware, OH 43015



Easy Conversion

Alan Cirkovic's "Little Wonder" (December 1984, p. 72) works on the Models 1000, 1200, and 2000 when you incorporate the changes shown in the Program Listing. Also, to scan through the file one record at a time on the 1000, 1200, or 2000 use the plus (+) and minus (−) keys instead of the arrow keys.

—Eds.

More Dumping

These alterations adapt Skip Murrow's DMP 400 screen dump (Tidbit #7, June 1984, p. 143) and Mark Rife's modifications (Reader Exchange, October 1984, p. 129) to run on the Gemini-10X printer. First, change lines 6020 and 6260 to read:

```
6020 LPRINT CHR$(27)CHR$(65)CHR$(6)
  'Adjusts line feed spacing
6260 LPRINT CHR$(12) 'Form feed
```

Now add the following lines:

```
6022 LPRINT CHR$(27)CHR$(71) 'Double
  strike
6024 LPRINT CHR$(27)CHR$(85)CHR$(1)
  'Uni-direction
6262 LPRINT CHR$(27)CHR$(64) 'Re-
  initialize printer to original setting.
```

I chose the double strike and unidirectional codes because they give you a sharper printout.

Dan E. Sitch
R.F.D. 1 Box 445
Pittsburg, NH 03592

Reader Assistance

Does anyone have a patch for Model III SuperScripsit that will let me use the full 80 tracks on drive zero? I converted SuperScripsit to an 80-track drive and put all of the Electric Webster dictionaries on the same disk. Although everything fits onto the disk, I get the message "No room left on diskette" when I try to open the document.

Jerel Peterson
Box 182
Cando, ND 58324

Error Trap

The Program Listing in the final Pascalculations column (December 1984, p. 148) is incomplete as published. For a copy of this missing section (EVAL), write to Reader Exchange, c/o *80 Micro*, 80 Pine St., Peterborough, NH 03458.

—Eds.

Program Listing. To make "Little Wonder" run on the Models 1000, 1200, and 2000, modify it as shown here.

```
10 KEY OFF: CLEAR 200:CLS:PRINT STRING$(63,"*"):PRINT:PRINT
80 MD$="B" ' highest drive number
85 DF$="B" 'default drive for files
380 IF YC=3 THEN CLS:INPUT "WHICH DRIVE";D$:IF D$>MD$ THEN 210 ELSE Q$=D$+":":FI
LES Q$:FOR X=1 TO 15000:NEXT:GOTO 210
520 IF INSTR(FL$,":")<>0 THEN  DN$=LEFT$(FL$,1): FL$=RIGHT$(FL$,LEN(FL$)-2):ELSE
 DN$=DF$
530 IF INSTR(FL$,".")=0 THEN FL$=FL$+".DTA"
540 FL$=DN$+":"+FL$
2020 OPEN FL$ FOR INPUT AS #1
3140 IF I$=CHR$(45) OR I$=CHR$(95) THEN Y=Y-1:IF Y<1 THEN Y=1
3150 IF I$=CHR$(43) OR I$=CHR$(61) THEN Y=Y+1
6050 OPEN FL$ FOR OUTPUT AS #1
```

End

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To properly install the 13 patches in Andy Levinson's "Patch Work" (January 1985, p. 112), insert one space before the asterisk and one space after the number following the asterisk.

—Eds.

Errors in J. C. Sprott's utility, "The Missing Disassembler" (October 1984, p. 108) generate incorrect Z80 mnemonic code. First, to correctly decode the two byte instructions, change line 360 to read:

```
360 IF J=203 AND J1>63 THEN A(J)=
  A3(INT(J1/64)):
B=RIGHT$(STR$((J1 AND 56)/8),1)+ ","
  +B1(J1 AND 7)
```

Second, the operand, "A," for the SBC opcodes is missing and the memory refresh register instructions (LD R,A and LD A,R) aren't included. I added the following lines:

```
145 FOR I=152 TO 159: B(I)= "A, "B1 (I
  AND 7): NEXT
935 IF J1=79 THEN A(J)= "LD": B(J)=
  "R,A"
1005 IF J1=95 THEN A(J)= "LD":B(J)=
  "A,R"
```

Also, change the first 30H in line 490 to 20H and OURIR in line 510 to OTIR. I added the statement ELSE F=F+ "." to line 330 to show the conventional format for nondisplayable ASCII characters.

Ken Wodtke
1913 Cervato Dr.
Camarillo, CA 93010

Here are our solutions to the problems you might encounter with "Scripsit Extras" (August 1984, p. 68). First, if you get the response "File access denied due to password protection" when you try to use Debug, use a general file program that unprotects the Scripsit file. We use NEWDOS80 to avoid password restriction problems.

In addition, the problem with printing occurs because the area chosen for storing the translation table isn't an unused memory area in your Scripsit. Instead, the print function uses this area. The solution to this problem is to change the table's location; the first 2 bytes in the program are an ideal place. First, relocate the table to the new address (hex 5202 or 5303 depending on your version) and make the following substitutions:

Replace

434F 5059 5249 4748 5420 3139 3739 20425920
5241 4449 4F20
5348 4143

with

9B1B 9C1C 9D1F 315B 325C 335C 345E 355F
3660 387C 397D
307E 3A7F

Finally, replace the old table address of 7AD8 with either 5202 or 5203. Newcode 1 should read: E5 06 0E 21 02 52 (or 53). Good luck with your updates.

Richard W. Harrison and
Louis S. VanSylck
2107 Middlesex Road
Upper Arlington, OH 43220

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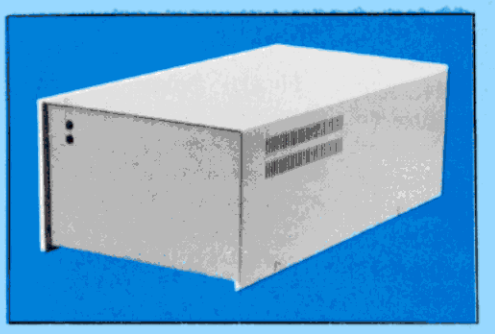

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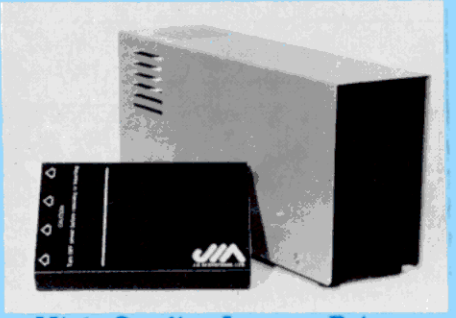

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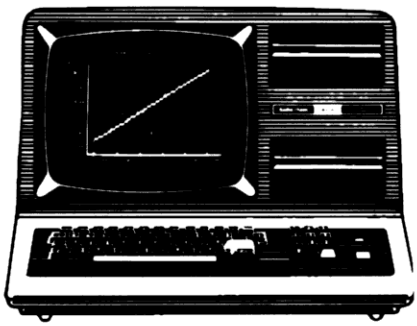

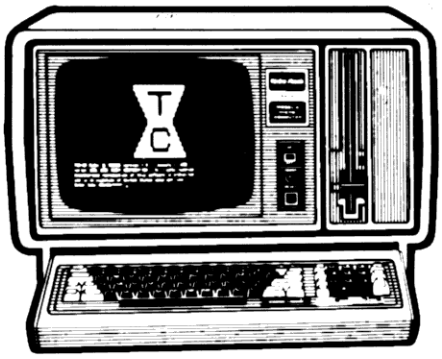

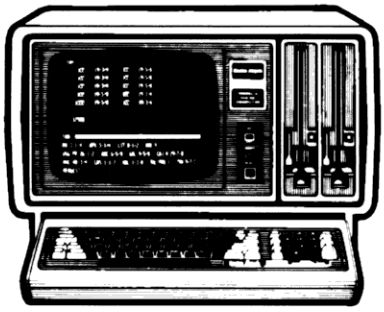

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Through the Looking Glass: The Tandy 1200 HD

by Bradford N. Dixon

edited by Ryan Davis-Wright

Tandy's newest effort in the MS-DOS world is, in their words, a "mirror image" of IBM's hard-disk PC/XT. But the Tandy 1200 HD offers one big advantage: a $2,999 price tag, compared with $4,395 for the IBM. Functionally, the 1200 is as compatible with the PC/XT as you can get. And with the money you save from the lower price, you can afford some of the software you'll want to run on the machine.

Photo 1. The Tandy 1200 HD.

Product Specifications

Like the PC/XT, the Tandy 1200 is built around Intel's 16-/8-bit 8088 microprocessor (see Photo 1). The detachable keyboard is lighter than the PC/XT's and it's approximately 17¾ inches wide, 7⅔ inches deep, and 1½ inches high. The system unit itself measures about 19 by 15⅓ by 5¾ inches.

The Tandy 1200 comes with 256K RAM standard, expandable to 640K with additional memory boards. One 5¼-inch floppy drive acts as drive A on the machine, while the 10-megabyte, 5¼-inch fixed disk is configured as drive C. The 84-key keyboard is in the familiar PC/XT style and its softer feel reminds me of the Tandy 2000 keyboard.

A parallel printer port comes standard, as do the plug-in disk controllers for the floppy and hard disk drives. While the 1200 provides five expansion slots, only three accommodate add-on cards; Tandy uses the other two for the disk controllers and the optional (but necessary) monochrome or color graphics card with a video port. The color graphics card (catalog number 25-3043, $299) supports both the monochrome and color graphics capabilities of the machine, while the monochrome board (catalog number 25-3040, $219) supports only a monochrome monitor.

Unlike Tandy's other computers, the 1200 comes with no operating system or Basic. You have to buy MS-DOS and GW-Basic as a separate package (catalog number 25-3130, $89.95). This seems to underscore Tandy's philosophy that the 1200 isn't aimed at the diehard programmer; rather, Tandy targeted the 1200 for a business environment where the user has little need to learn MS-DOS or Basic.

Setting Up the Machine

The 1200's inside and outside appearance is similar to the PC/XT's, the Tandy logo being the most noticeable difference. The front of the machine features the 10-megabyte hard drive on the right, with the floppy drive to its left.

The on/off switch is on the right side of the rear panel. The back of the system also holds the power connector, power supply fan, speaker vent, keyboard connector, and five expansion slots.

When you begin configuring the 1200, you may have to open the machine to set the DIP switches for the amount of RAM and the color monitor. All you have to do is remove four screws on the back to slide off the cover.

Since the unit doesn't come with a monochrome or color card, you have to install one. The layout inside the machine is uncluttered and there's ample room to get at the DIP switches (see Photo 2).

After inserting a color or monochrome graphics card and connecting the 1200 to a monitor, you're ready to set up the system. The Tandy 1200 MS-DOS disk you buy to use the machine contains the LLFDFMT (low-level, fixed-disk formatting) utility, the first step in formatting the hard disk to run as a system and data disk. While the entire process of formatting the fixed disk takes an hour, you only have to do it once.

After formatting the hard drive, move the MS-DOS operating system and system files to it and configure the machine to boot directly from the drive when you turn the power on. All the instructions for formatting and configuring the hard drive are listed in an easy-to-follow form in the com-

puter's instruction booklet.

The booklet is easy to understand, and it gives you the information you need to get the system up and running. It also gives you an overview of the MS-DOS commands you'll use most often. The booklet contains only four chapters: Turning It On, Telling The DOS What To Do, Turning It Off, and Options. The appendixes at the end of the booklet augment the information in each chapter.

Compatibility and Things to Watch

Tandy claims that all PC/XT add-on cards fit and function in the 1200. During the review of the 1200, I used an IBM color graphics card and an IBM RS-232 card without a hitch.

Tandy also promised software compatibility and I found only a few programs that didn't work on the 1200: Prosoft's Dotwriter and Muse Software's Castle Wolfenstein.

All in all, the 1200 performed just as expected from both a hardware and software standpoint. However, you'll want to be aware of a few quirks in using the system. If it doesn't respond to your color or monochrome monitor, make sure the internal DIP switches are firmly set. When I got my 1200, it was supposed to be configured for a color monitor. But the system didn't work until I put the DIP switches in the proper positions.

Tandy's version of MS-DOS takes 10K more RAM than the PC/XT operating system, so you have less memory available to store and manipulate data in spreadsheet programs.

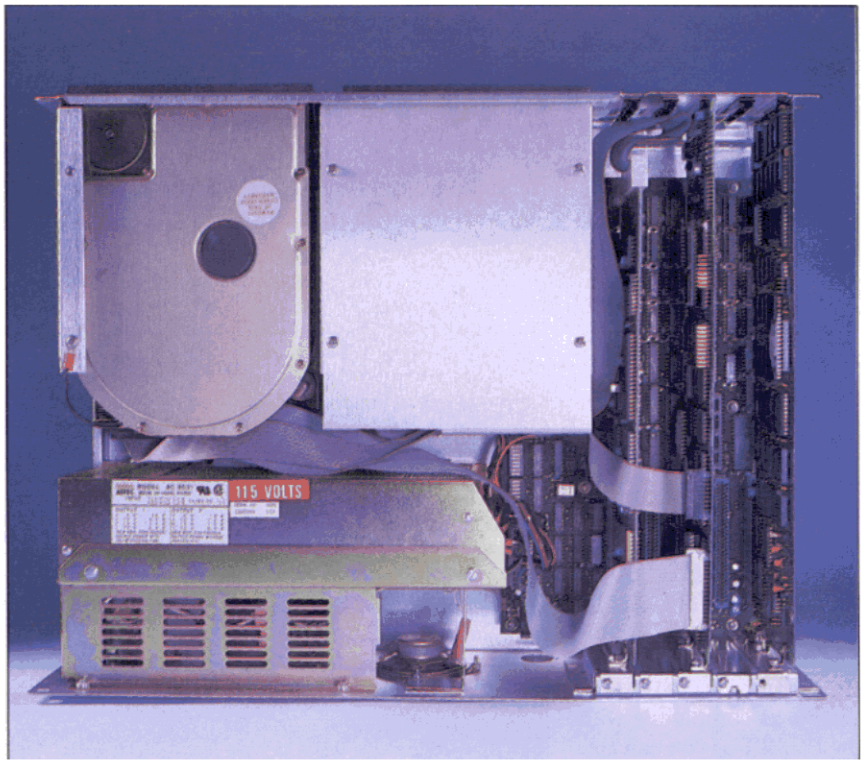

Photo 2. A look inside the Tandy 1200.

Some DOS commands familiar to XT users may not work on the 1200 until you install ANSI.SYS with the operating system. ANSI.SYS is already incorporated onto the IBM system, but you have to activate it on the Tandy 1200 before you can call commands like CLS from the DOS prompt. Another idiosyncracy that both PC-DOS and Tandy's MS-DOS exhibit is an inability to call MODE from a subdirectory unless you first invoke the Path command.

The Norton Utilities disk diagnostic package (a Super Utility program for the PC family) didn't come up in color as it does on the XT, but the program worked properly except when examining the hard disk. Since the 1200's hard disk is configured differently from the PC/XT's, version 2.0 of the Norton Utilities won't check it, but 3.0 will.

I also noted some color incompatibility when I ran Infocom's interactive fiction games. While the games functioned properly, they apparently didn't recognize the 1200's color graphics board. As a result, the programs didn't ask if you're using a color or monochrome monitor.

Conclusion

The 1200 is an affordable alternative to the IBM PC/XT. Tandy promises that it runs almost all PC/XT ware and accepts IBM option cards. All this for $1,400 less than the Big Blue machine.

The Tandy 1200 may not make a big dent in the corporate market, which IBM dominates, but it's a quality choice that will help Tandy reposition itself near the front of the business micro market. ■

Tandy 1200

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The 1200 HD: Notes from a Model 4 User

by David A. Williams

Why did this dedicated Model 4 user buy an IBM clone? For one reason only: To enter the mainstream of the computer field.

I really like the Model 4 and think it one of the most underrated computers around. But Big Blue has spoken and you'd have to be deaf not to hear the message. In fact, the company I work for has a variety of computers (including Model 4's) but, by company policy, any new computer must be IBM-compatible. So, I'm trying to learn a new system and it's not easy.

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As I write this, little technical information is available on the 1200. Radio Shack store and Computer Center employees don't know much about it, at least in my area. And Tandy has yet to publish any specifications on it.

The 1200 is certainly a more difficult system to buy than the Model 4, where all you have to do is take it home, plug it in, and you're off. With the 1200, you have to make all these decisions: Monochrome or color monitor? How much memory? RS-232 port? Expansion boards?

As if the initial decision-making weren't enough, a huge aftermarket of IBM-compatible hardware accessories exists. You don't even have to buy Tandy. You can choose from dozens of display adaptors, memory expansion cards, multipurpose expansion boards, graphics cards, and other add-ons available from many different suppliers, including mail-order discount houses.

Tandy says it will stock third-party accessories, but apparently will charge list price for what is heavily discounted elsewhere. One Computer Center was pushing the Tecmar Captain, a multipurpose memory expansion board with 384K of RAM, serial and parallel interfaces, a real-time clock, and utility software for $795. I've seen it advertised for under $600 at mail-order houses.

The Machine

The first thing I noticed about the 1200 was the statement on the carton: "Custom-made in the USA for Tandy." Reportedly, Tandon, the company famous for its floppy and hard disk drives, makes the system unit. The machine looks good even though it's pretty heavy. And its thick-painted steel cabinet appears to be durable.

The mirror image falls a bit short when it comes to the expansion slots, however: The 1200 has only five compared to the XT's eight. Three of these are reserved for the disk controllers and the monitor adapter card, which you have to install before you turn on the machine. Consequently, you may need multifunction expansion boards if you want to add many features. (The processor board has a socket for an 8087 math coprocessor chip.)

The 1200's start-up is a little difficult because of the hard disk initialization, but the manual explains

COUNTERPOINT

There's a fine line between inexpensive and cheap. At first glance, I thought the 1200 overstepped that line. My test model had gobs of epoxy holding the hard disk cables to the controller board, awkward DIP switches (I tried one setting that made everything work fine, except that I couldn't format floppy disks), and a case screwed shut so tightly that I needed the Jaws of Life to put in the display adapter.

Since then, however, I've fallen in love with the 1200. It works like a charm, running every piece of non-graphics software I've tried (I use the basic monochrome adapter and monitor). It has such swift and spacious Winchester storage that I'll hate to give it up and go back to floppies.

The keyboard is responsive and an excellent improvement on the IBM standard. I would gladly pick the economical VM-3 monitor over the CM-2 color display, since it has much sharper text.

Most of all, Tandy's price sweeps away objections as it sweeps away competitors. While it's a crime to charge extra for DOS and it's sad that Tandy has signed a death warrant on the Model 2000, the 1200 is simply too good a deal to pass up.

—Eric Grevstad

I use an IBM PC more than any other computer. Except for the 10 megabyte hard drive, I don't see that much difference between the PC and the 1200. The styling and colors are similar, and both machines have five 13-inch expansion slots. Since they're so alike, any comparison comes down to picking nits.

Like most PC clones, the 1200 has an improved keyboard layout. You can reach the shift and return keys, and red LEDs indicate when you've engaged the Caps and Num Lock keys. The keyboard doesn't clack annoyingly like the PC's but it's mushier and slower.

Mass storage is always impressive. The hard drive is quick and quiet once you format it. But formatting takes an hour and the instructions don't always follow the actual screen displays. The hard drive utilities, specific for the non-IBM format, work just fine.

Judging from a few sessions, the 1200 is highly PC compatible. Most of my regular programs worked normally: WordStar, VisiCalc, Thinktank, Gato. The Norton Utilities (highly regarded MS-DOS utilities) generally worked fine, except the hard drive utilities in version 2.0 didn't recognize Tandy's hard disk format. Then new version (3.0) had no problems. But Sorcerer didn't come up in color and Castle Wolfenstein quickly bombed.

The 1200 is nice, especially considering its price. While I don't trust it yet (I want to look at it some more and try other PC software), I think the 1200 will eventually prove its worth.

—Dave Rowell

My first impressions of the Tandy 1200 were mixed. I've been using a Model 2000 for a year, so it seemed as if the 1200 were a step backward. But I was intrigued with its low cost.

I found the Tandy 1200 mostly identical with the IBM PC/XT. The degree of compatibility Tandy incorporated into the machine is impressive. In terms of software, the 1200 ran as an IBM PC/XT, quite a feat when you consider that the IBM PC/XT depends heavily on its ROM code.

Setting up 1200's hard disk is more complex than on the Tandy 2000. The hard disk formatting and initialization routines require about an hour to run and you must run the low-level format routine twice. Then you have to format and partition the disk as the final step.

In conclusion, I saw little difference between the Tandy 1200 and the IBM PC/XT in hardware, firmware, or software. The most startling differences are those perceived by a regular Tandy 2000 user. The difference in performance between the two machines is overwhelming. While the 2000 is in another league, Tandy will probably sell a lot more 1200s.

—John B. Harrell III

everything clearly. Even first-time computer users should have little trouble. Don't ignore the errata sheets because they contain information on the start-up.

A diagnostic program that checks the processor and memory runs every time you turn on the computer. A message on the display tells you how much memory you've installed. If the hard disk contains the DOS, it will boot automatically and prompt you for the date and time.

The keyboard has a metal base with a plastic cover, and follows the general layout used in other PC compatibles. Model 4 owners may be overwhelmed just by the number of keys. Many of the symbols are in different positions and the Model 4 lacks several of them. If a PC industry standard exists, the 1200's keyboard comes close to it.

Tandy integrated the arrow keys on the keypad with the number keys in a diamond arrangement. You use the "Num Lock" key to toggle between the keypad's numbers or arrows. This key and the Caps Lock key have an illuminated indicator to tell you what mode they're in.

Tandy offers both monochrome ($219) and color monitors ($549.95), with the necessary adapter cards ($219 and $299, respectively). The color adapter provides high-resolution graphics when used with the monochrome monitor and adapter.

If you do a lot of word processing or spreadsheet work, you'll want the monochrome monitor. From my own experience, the color monitor/adaptor doesn't have sufficient resolution for long-term use for those types of applications.

If you do buy the Tandy monochrome monitor, make sure it's the VM-3 (catalog number 25-3010). It's the only one compatible with the adapter card. It features green letters on a black background and a nonglare screen. The contrast and brightness controls are on the front panel. While the VM-3 can display dual intensities, it's difficult to distinguish between them if you set the contrast control too high.

Nothing in the literature indicates the 1200's pixel resolution. The display is sharper than the Model 4's, with the characters more delicately formed and the individual dots less noticeable. This makes for a flicker-free display, but data tends to smear when you scroll it.

MS-DOS vs. TRSDOS

For an extra $89.95, you get the MS-DOS 2.11 operating system and GW-Basic. My first impression is that MS-DOS will be easier to learn than TRSDOS 6.X. Redirecting the input and output seems more simple. For example, "Copy CON file name" directs output from the keyboard (console) to a disk file while simultaneously displaying it on the screen. Batch processing, which corresponds to the Model 4's job control language, is also easier. The DOS Print command automatically invokes a spooler without the process TRSDOS involves.

On the other hand, there is no Forms/FLT, KSM/FLT, or Memdisk. But with a hard disk, you don't really need the last.

MS-DOS includes a line editor, but it seems a little awkward to use. Perhaps this will change with experience. I have yet to find one I like as well as the one that comes with the Model 4 Assembly Language Development System. There is a Debug utility that has some pluses and minuses compared to the one with TRSDOS. The Debug includes a disassembler that can be run from within.

While GW-Basic has more statements and functions than Model 4 Basic, many of these have to do with graphics. And, of course, you have to have a graphics card to use them. Both a line and screen editor are provided within Basic for program generation and editing.

Documentation

At this point, I can only rate the documentation as fair. The DOS and Basic manuals are supplied in 9-inch, three-ring binders, but neither has an index. This is especially difficult to understand, since other MS-DOS manuals nearly identical in content and organization have them. I've already wasted a lot of time looking around for things.

The overall DOS description is better than TRSDOS, but with fewer examples illustrating the commands. There is no data that would be needed by Assembly-language programmers, but perhaps this will come. Something similar to the Model 4 Technical Reference Manual is needed.

The Bottom Line

I like this machine and I'm looking forward to using it. I finally feel like I'm part of the real world of computers. It's nice to read software and hardware reviews without feeling left out. While I wish I had the performance of the Tandy 2000, the Tandy 1200 has the degree of compatibility I need. ■

CP/M 2.2 Revisited

by John B. Harrell III

Montezuma Micro has significantly improved its version of CP/M since I last reviewed it (March 1984, p. 94), particularly in terms of hard disk support. The new version is available as a $15 upgrade to previous Montezuma Micro CP/M owners. You receive Montezuma's revamped documentation, a disk with the upgraded CP/M system on it, and a second disk with the hard disk drivers.

New System Features

The first surprise you notice when you boot up the disk is the banner. Jesse Bob Overholt (of The Alternate Source fame) has overhauled CP/M's Basic input/output system (BIOS), the operating system's nucleus. In addi-

Continued on p. 113

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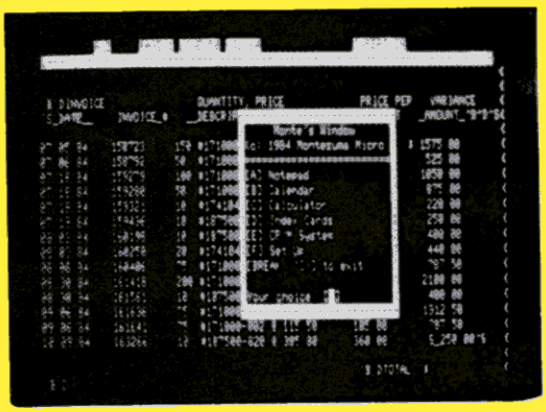

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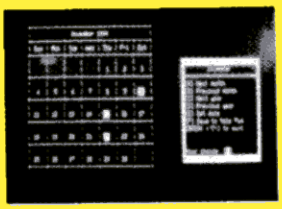

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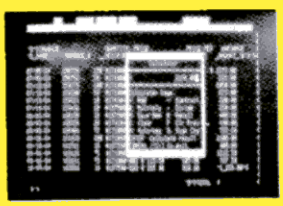

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That Sinking Feeling

Few things bring out a computer user's latent hostility like a disk error message. It's irritating enough that you can't complete your operation, but to add insult to injury, you'll often find the message incomprehensible; you're still left wondering what went wrong.

This article will help you make sense out of cryptic error messages like "GAT read error" and "CRC error during disk I/O." It'll also outline ways to repair disks and prevent disk errors. First, however, you need to know something about a floppy disk's structure.

The Disk Dissected

While it might appear that the only thing recorded on a floppy disk is the data you write to it, your disk operating system (DOS) formats disks with a boot sector, a directory of your files, and other information to guide the disk's controller hardware.

Most TRS-80 operating systems format disks with 40 tracks of data, each track consisting of 18 256-byte sectors.

The boot sector is the disk's first sector; the computer reads this sector first when you boot up the disk. On a system disk, the program contained in this sector bootstraps, that is, it loads the remainder of the DOS into RAM. On a nonsystem disk, the boot program displays an error message, indicating that the disk lacks a DOS to bootstrap.

Usually, the DOS devotes an entire track to the disk's directory, which tells the DOS where to locate your files.

But each track on a disk contains more than just data. Your disk controller hardware requires additional information so that it can locate each sector on a track and verify that the DOS has read the data contents of that sector correctly.

The small hole near the disk's center is called the index marker. It enables the disk controller to find the beginning of each track. From there, the controller uses data stored on the track to locate each of the track's 18 sectors. Your DOS writes this data to a disk during formatting.

Each disk sector has four parts: a type III gap, an identification (ID) field, a type II gap, and a data field (see the Fig.). The type III gap separates the ID field from the previous sector's data field, and the type II gap separates the ID field from the next data field.

The ID field contains all the identifying data for the sector. Its first byte, called the ID address mark, tells the disk controller that an ID follows. The second, third, and fourth bytes contain the disk track number, side number (for double-sided disks), and sector number. The fifth byte contains a code that determines the sector's length.

The ID field's sixth and seventh bytes contain its CRC, or cyclic redundancy check, characters (I'll explain CRCs a little later).

The data field is the part of the sector you're most familiar with. Its first byte, called the data address mark, tells the controller that data follows. The next 256 bytes contain data, and two CRC characters follow the data.

TRSDOS 1.3 numbers sectors from 1–18, but it increments the numbers by 3. Therefore, consecutive sectors are numbered 1, 4, 7, and so on up to 18. Sector 2 follows sector 16; sector 3 follows sector 17. This gives the software enough time to access the next-higher-numbered sector before the disk has revolved past it.

TRSDOS 6.1 carries this further by numbering sectors in increments of 6, starting with zero and ending at 17 on track zero. For each successive track, the starting sector's number changes, so that identically numbered sectors aren't adjacent. This provides better performance, but it means that TRSDOS 1.3-formatted disks aren't compatible with TRSDOS 6.1 disks.

Seeing for Yourself

To see exactly what TRSDOS 1.3 writes to a track during the formatting process, try the following patch:

```
PATCH *7 (ADD = 5CF3,FIND = 3E,CHG = F7)
```

Then format a blank disk in drive 1. After you enter the disk's name and password, the patch puts you in Debug. The DOS will write the contents of memory locations 6200–7D61 hexadecimal (hex) to the disk's first track. Locations 6100–61FF hex contain the granule allocation table (GAT) sector, and locations 5F00–5FFF hex contain the hash index table (HIT) sector.

DOS linguist Douglas Payne translates disk error messages and tells you how to correct and prevent them.

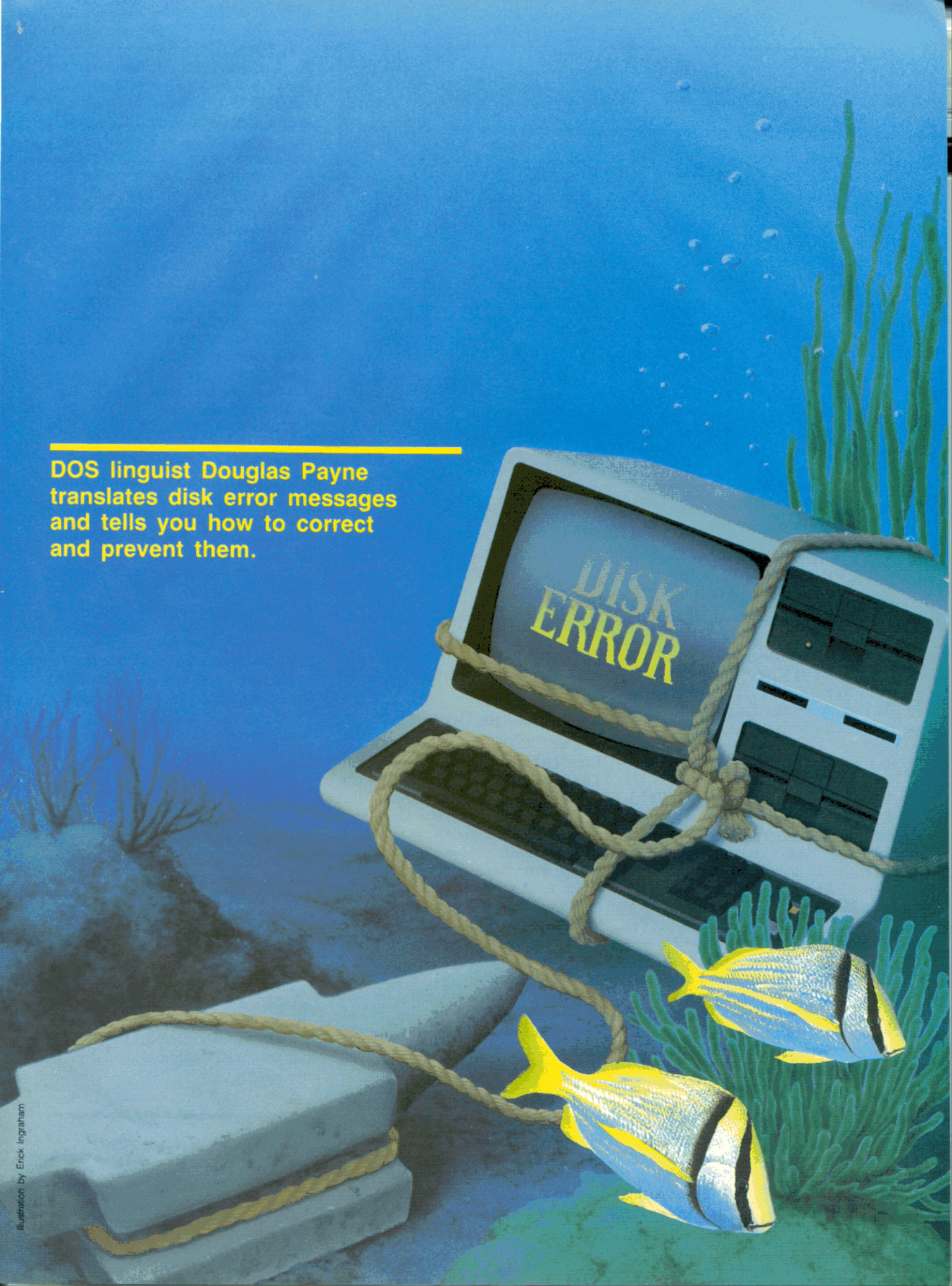


Illustration by Erick Ingraham

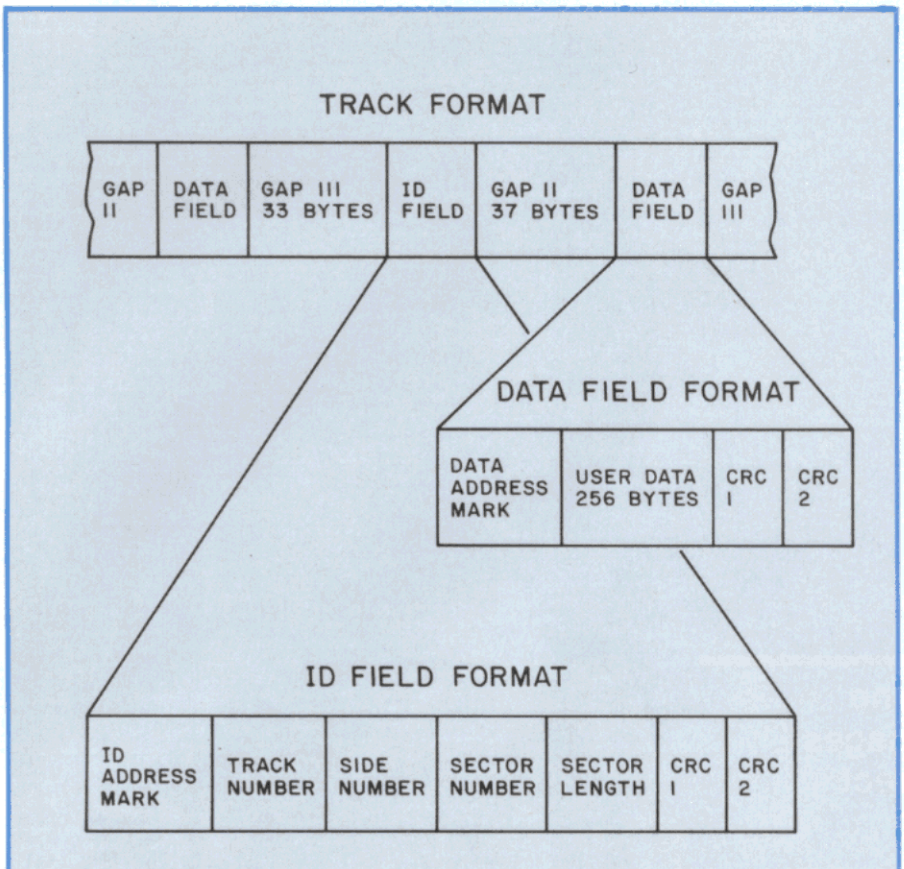


Figure. Disk format under TRSDOS 6.1.

Once you've displayed these locations, make sure you use the Q command to exit Debug without continuing the format. Reverse the patch to restore the format command:

PATCH *7 (ADD = 5CF3,FIND = F7,CHG = 3E)

To do the same thing under TRSDOS 6.1, format a blank disk, and when formatting is complete, enter Debug with the Debug (EXT) command. You can use the D command to display memory. Memory locations 2F00–4745 hex hold the contents of the last track written.

The CRC Factor

A cyclic redundancy check verifies that the data the DOS reads from a disk is the same as the data recorded in the first place. Each time the computer writes an ID field or sector of data, the disk controller computes a CRC using a complex algorithm. The CRC calculation includes every byte of data from the address mark up to, but not including, the CRC itself.

When the DOS reads a sector of data, the controller again computes the CRC and compares it to the CRC stored on the disk. If the two values don't match, the controller sets an error bit in its status register, which the disk input/output (I/O) software checks. The algorithm is accurate enough to detect almost all errors.

Error Messages Decoded

Since TRSDOS 1.3 and 6.1 have different error messages, I'll deal with TRSDOS 6.1's messages and describe the corresponding messages for TRSDOS 1.3. Other standard DOS messages might differ slightly, but they will essentially mean the same thing.

● *Seek error during read.* The disk controller seeks a track by positioning the read/write head at that track. The controller reads the first ID field it finds on the track. If the ID field's track number isn't that of the track the controller is seeking, and the ID field's CRC is correct, the controller sets a status bit indicating a seek error. If the CRC is bad, the controller keeps trying to find an ID field with a good CRC. If it finds none within four drive revolutions, it sets a CRC error status.

Seek errors usually mean that the disk drive hardware has malfunctioned. However, if the disk has a bad track with no valid ID fields, a seek error can also occur. To determine which problem is causing the error, try another disk. If the seek error persists, your drive needs realignment or other repairs.

TRSDOS 1.3 has no specific seek error. Under the circumstances described above, it would probably display the message "Disk drive hardware fault."

● *Lost data during read.* TRS-80 hardware and software use what's called programmed data transfer; the CPU must perform an I/O instruction to read or write each byte of data from disk. Since the disk revolves at a constant speed, the CPU must read or write each byte as soon as the controller requests it. If the byte isn't transferred before the next one becomes available, the controller sets a lost data status bit and terminates the I/O operation.

Lost data errors probably mean the disk is defective or the drive isn't turning at the right speed. If the error persists when you try another disk, it's time for drive maintenance.

TRSDOS 1.3 doesn't differentiate between lost data errors on reads and writes. In both cases its message is "Lost data during disk I/O."

● *Parity error during read* means a CRC error occurred while the DOS was reading a sector. The CRC error is in the data field, not the ID field.

CRC errors usually occur because data was read or written incorrectly. Occasionally, the CRC characters themselves can be incorrectly stored, also causing a CRC error.

TRSDOS 1.3 doesn't distinguish between CRC errors during data reads and writes; its corresponding error message is "CRC error during disk I/O."

● *Parity error during header read* indicates that a CRC error occurred while the controller was reading an ID field, trying to find the correct sector, rather than while it was reading a data field.

TRSDOS 1.3 displays the same error message it does for data field CRC errors, but uses a different error number.

● *Data record not found during write.* Before the DOS can read a specific sector of data from disk, it must inform the controller. The controller tries to locate the correct sector by reading the next ID field and comparing its track and sector numbers with those that the DOS requested. If it doesn't find a sector with the correct numbers within four disk revolutions, the controller sets the record-not-found status and terminates the operation.

System Requirements

Model III or 4
One disk drive

These errors usually mean the disk's ID field is bad.

The equivalent TRSDOS 1.3 message is "Disk sector not found."

● *Seek error during write* is the same as "Seek error during read," except that the error occurred before a write operation.

● *Lost data during write* corresponds to "Lost data during read," but for a write.

● *Parity error during write* means a CRC error occurred while the DOS was writing a sector to disk.

● *Data record not found during read.* Since the DOS writes the ID fields when it formats a disk, this error can occur for the same reasons as during a read.

● *Write fault on disk drive* tells you the controller has detected some kind of error while writing to disk. This indicates a hardware malfunction in the drive or the controller.

The corresponding TRSDOS 1.3 message is, "Write fault on disk I/O."

● *Directory read error, Directory write error.* These messages indicate that an error has occurred during I/O to the directory track. Try another disk to determine if the problem is in your hardware or the disk.

TRSDOS 1.3 uses the same messages.

● *GAT read error, GAT write error* mean an error has occurred during I/O to the granule allocation table, a special sector on the directory track containing information about the disk's sector allocation. The DOS uses the GAT to determine which sectors are available for a new disk file or for an extension to an existing file.

Both DOSes use the same messages.

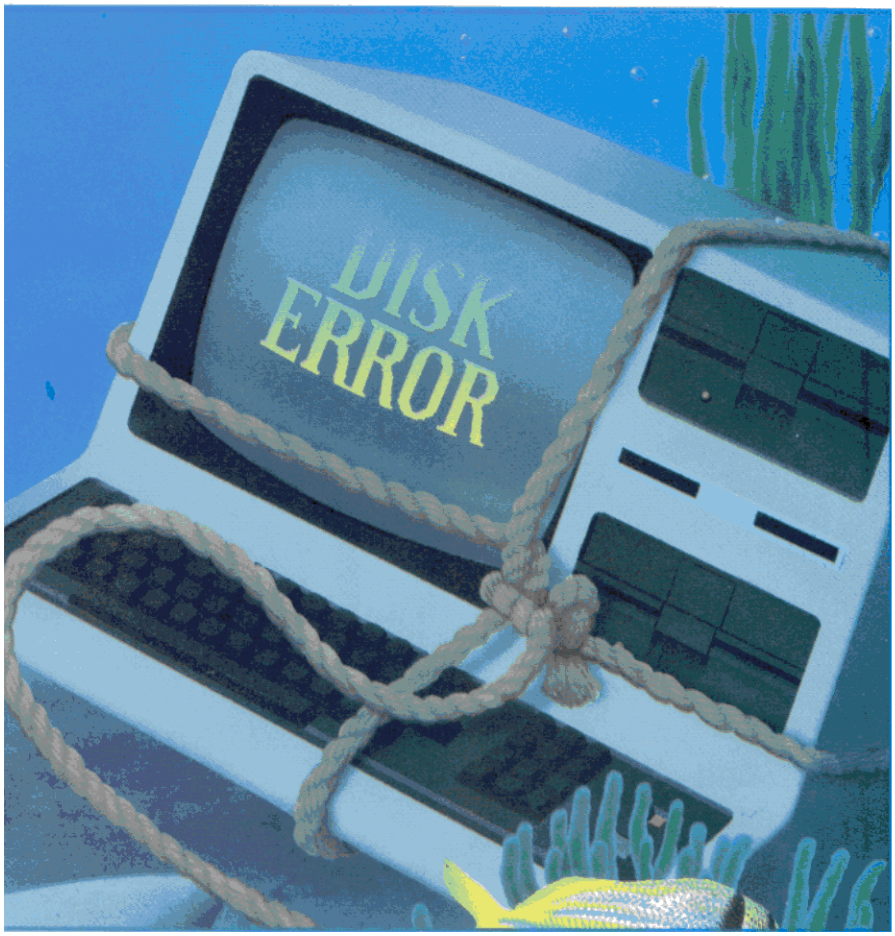
● *HIT read error, HIT write error* indicate the disk controller detected an I/O error while reading or writing to the hash index table. This is another special sector on the directory track containing a 1-byte hash code representing each disk file's name. The DOS uses the HIT to locate a file's directory record, which is on another sector of the directory track.

Again, both DOSes use the same message for this error.

Other Error Messages

You've probably encountered other error messages during disk I/O. Most of them, such as "Illegal logical file number" or "Attempt to read past EOF" result from bugs in your program.

In a few cases, hardware may be at fault. For example, if you get an illegal drive number message when you try to access a disk under TRSDOS 6.1 and you're certain the drive contains a valid disk, something's wrong with your controller or the drive. If TRSDOS 1.3 displays a "Disk drive not ready" message for no obvious reason, you probably have hardware problems.



Now What?

Once you know how to interpret your DOS's disk error messages, you can start troubleshooting. The first thing to do is determine whether the disk or your hardware is faulty.

Retry the operation on another disk—I always keep a couple of blank formatted disks on hand for such occasions. If the problem recurs, it's time to take your system to the repair shop. If the operation works without error, you have a bad disk.

Don't think you have to junk a disk because it's generating error messages. If you haven't already done so, buy a good disk utility program. Powersoft's Super Utility is one of the best; I'll go into its capabilities in some detail to demonstrate what you can do to repair a disk.

I'll discuss Super Utility 4/4P, which runs only on the Model 4/4P but can access most Model I or Model III disks. All the utilities I'll mention are also available in Super Utility Plus 3.2, which runs on the Models I and III, and on the Model 4 in Model III mode.

Repairing the Damage

Although Super Utility comprises dozens of utilities, I'll concentrate on those that help you diagnose and repair disk problems. The utilities are divided into seven groups: zap, purge, disk format, back-up, repair, memory, and file utilities.

● *Zap utilities* let you examine and alter a disk's contents by directly addressing the disk by track and sector. The Verify Sectors and Display Sectors options validate and display the data on any number of sectors. They're useful for finding exactly which sectors will cause errors, and identifying those errors.

The Copy Sectors option lets you copy a sector from one disk to another, meaning you can replace a bad sector with good data from another disk. The Read ID Address Marks option lets you quickly find errors in sector headers.

● *Purge utilities* are mainly for cleaning up disks, letting you remove files in a variety of ways and remove file passwords or system files.

● *Disk format utilities* include the Format Without Erase option, which lets you format a disk without losing data. Super Utility does this by reading the sectors on each track into memory before formatting them, then writing the sectors once it has formatted the track.

With this option you can sometimes recover data on a disk that gives periodic errors.

● *Back-up utilities* include a standard back-up function similar to the DOS's, and a special backup for disks with damaged formatting information.

● *Repair utilities* help you restore damaged disks. Since the Boot, GAT, and HIT sectors are accessed more than other sectors, they're the most susceptible to damage. As they're also the most important sectors, along with the directory, Super Utility provides utilities to repair each of these sectors.

The GAT repair option lets you repair the granule allocation table itself or the whole sector, which also contains the disk's name, password, creation date, and Auto command. Super Utility repairs the GAT by going through the directory to determine which granules are really in use.

The HIT repair option lets you reconstruct the entire HIT table. You can verify the GAT and HIT with the Check Directory option, which does a complete check of the disk's directory and lets you automatically correct any errors or inconsistencies it finds.

The Boot Sector option replaces the Boot sector on TRSDOS 2.3, 1.3, and 2.7 double density system disks only. For other DOSes, you have to use the Copy Sectors option in the zap package.

● *Memory utilities* let you examine and alter your system's memory; you can also search for a specific string of bytes or characters in memory, read or write a byte to any I/O port, and read an entire track from disk into memory in order to examine it.

This last option lets you see exactly what's recorded on a disk. It reads and displays all the information on the track, including index fields, CRC characters, gaps, and address marks. If you don't change any of the track's formatting information you can even write the track back to disk using the format utilities' Write Format Track option.

● *File Utilities* are similar to zap utilities, except they're for files rather than disk sectors. Super Utility uses the directory information to find files, so you don't have to locate files yourself. You can display file sectors, copy files, display free space, and display file locations, among other things. The Sector Allocation option determines which file a particular sector belongs to.

The Disk Allocation option displays a map of the disk with information about each sector, whether or not it's in use, and whether or not it's locked out due to errors. This option corresponds to the standard DOS Free command. One option lets you compute any file name's hash code, another encodes and decodes passwords.

An Ounce of Prevention

Disk errors are no fun. They can cost you hours or even days of hard work. You can save yourself trouble by treating your disks with tender care. Don't bend, staple, or paper-clip them; keep drinks away from them; don't expose them to electromagnetic fields (such as electric motors), and don't touch the exposed parts. Disks are extremely vulnerable to smoke and dust contamination—if they weren't, they probably wouldn't need CRC's.

Invest in some hard plastic disk cases. And above all, buy high-quality disks. If your system has double-density drives, don't buy single-density disks, even if your best friend does it all the time. The same holds true for double-sided drives: Buy disks rated for double-sided operation. Often, manufacturers test only one side of a single-sided disk for errors.

Give your drives the same consideration as your disks. If you don't have a disk drive cleaning kit, get one. Clean your drives once every month or two; cleaning too frequently can result in premature head wear.

If you want to know exactly how your drives are performing, buy a disk drive diagnostic utility. Simpler programs measure only your drive's rotational speed, while the really sophisticated ones can also check head alignment and index hole detector adjustment.

Further Reading

If you're interested in how your system's disk hardware works, see Radio Shack's Model III or Model 4 technical reference manual. Both models use Western Digital's WD1793-01 floppy disk controller chip. Western Digital's "WD179X-01 Floppy Disk Formatter/Controller Family" specification sheet contains more specific information on the controller's function than the technical manuals. *Inside Super Utility Plus 3.0/3.2* by Paul Wiener and Gary Camp, and *Super Utility+Tech Manual* by Kim Watt, both available from Powersoft, are also excellent sources of information. ■

Douglas Payne works in the computing services department of the University of Waterloo. You can contact him at 58 Brendawood Crescent, Waterloo, Ontario N2J 4J5, Canada.

Related Articles

Hart, W.D. "Does FORMAT Get Your BACKUP?," January 1982, p. 217. Patch the Model I back-up utility so you can use glitched disks.

Meyer, Vincent E. "Drive Ways," September 1984, p. 43. Disk drive repair and preventive maintenance.

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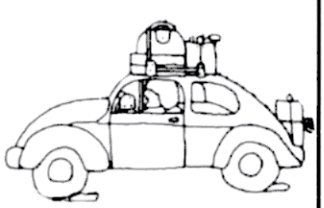

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No matter what you want to do with Model III graphics, chances are you can do it with Graph. This full-screen graphics editor has a battery of commands that let you draw lines and circles; mix different backgrounds into a single design; create mirror-image, upside-down, or rotated displays; and switch the video from standard format to reverse video and back. You can store part of a screen and redisplay it anywhere you want. A temporary file automatically saves and updates screens in progress for easy recovery. In addition, you can print graphics in a variety of sizes and shapes on Epson or Radio Shack printers or store screens on disk for inclusion in Basic or machine-language programs.

Program Notes

The machine-language program Graph performs most of the graphics functions (see Program Listing 1, p. 50). Three Basic programs handle special functions: UTIL1/BAS (Program Listing 2, p. 83) draws circles, UTIL2/BAS (Program Listing 3, p. 83) displays a list of commands, and UTIL 3/BAS (Program Listing 4, p. 84) handles rotation and explosion effects. The machine-language programs Load/UTL (Program Listing 5, p. 85) and Save/UTL (Program Listing 6, p. 85) provide the interface between Graph and the Basic programs. A separate machine-language program, Display (Program Listing 7, p. 85), lets you view graphics from DOS level.

Once you assemble the programs and save them to disk, all you have to do is run Graph/CMD; this controls the whole package, calling the other routines or utilities as needed. When you run Graph, it displays a logo, then a clear white screen.

Image-Building

The arrow keys control drawing direction; the cursor, like a pencil point, marks your position on the screen. To move diagonally, combine two keys; for example, pressing the up- and the right-arrow keys moves the cursor northeast. To speed up the cursor, press the 1 key repeatedly until the cursor attains the speed you want. Pressing the 2 key slows down cursor movement. The cursor wraps around the screen; if you move off the screen to the left, it reappears on the extreme right.

The M key selects a drawing mode, toggling between black and white pixels. For nondestructive cursor movement, press K. If you press K a second time, the cursor reverses each pixel it moves over; black pixels become white and vice versa.

To clear a screen to black, press C. Pressing W clears a screen to all-white. Pressing N reverses all video on the screen—Fig. 1 shows the Graph logo, Fig. 2 shows the same screen in reverse.

With the K option invoked for non-destructive cursor movement, you can make precise corrections. Place the cursor over the pixel you want to change and press the space bar; Graph reverses the pixel from white to black or from black to white.

For a gray or checkerboard background, press Q; doing so lights every other pixel on the screen. Pressing H or V creates a background of horizontal or vertical lines. H and V disrupt the display considerably; if you've put much work into a screen, its best to save it before invoking them. While Q, H, and V don't erase the display, the random background command, R, does. It fills the screen with random graphics blocks.

To turn a screen display upside-down, press U. Press B for a backward or mirror-image display (see Fig. 3).

Graph draws lines automatically if you want it to. Position the cursor where you want the line to begin and press the comma key. Then move the cursor to the line's end point and press the period key, followed by B for a black line or W for white.

When you lose the cursor or want to abort a function, press the break key and Graph will return the previous screen. If the program isn't handling a function when you press the break key, the display starts to disintegrate; to restore it, press break again. Otherwise, Graph returns to DOS.

Michael Leibow's graphics program won grand prize in *80 Micro*'s 1984 Young Programmer's contest (see February 1984, p. 48)

Figure 1. Graph logo.

Figure 2. Reverse-video version of Graph logo.

Figure 3. Mirror-image of Fig. 2.

Figure 4. Display options of shift key function.

Figure 5. Explosion effect.

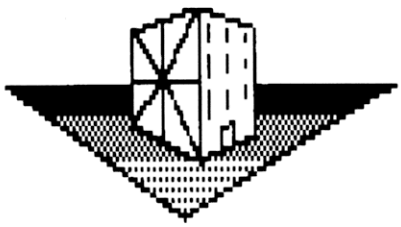

Figure 6. Medium-sized printout.

Figure 7. Printout using pixel size 3,6.

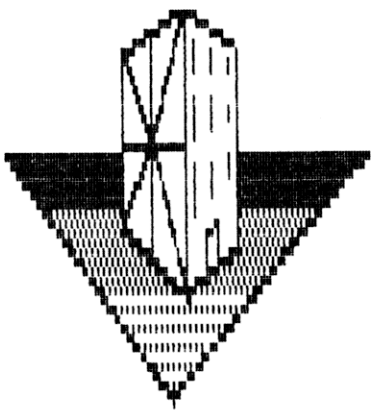

Figure 8. Printout using pixel size 1,4.

Saving Your Screens

Graph's file-handling features let you work on several screens at a time, or use parts of one screen in another display. In addition to files saved on disk, Graph maintains two files in memory, in what I call temporary and permanent files. The temporary file stores your display before you call an ancillary program function; Graph updates this file frequently, so you can restore a screen lost through a mistake. To load the temporary file, type in LT.

To save a screen to the permanent file, press S. Each time you type in S, Graph stores the new screen in its permanent file without the possibility of data loss. You can load the permanent file by typing in LP; you can move back and forth between a screen and the permanent file by pressing E.

If you make a mistake and want to recover the original screen by typing in LT, it's a good idea to save your current screen first. That way, if the temporary file doesn't have your screen, you won't lose everything.

Graph also supports four disk functions. To save a file to disk, type in DS; to load a file from disk, type in DL. The cursor will flash until you type in a file name of eight or fewer characters with no extension. When you press the enter key, Graph reads from or writes to disk.

Typing in DC displays a catalogue of Graph-created files saved to disk. You can use the arrow keys to position the flashing cursor over a file name, then press the enter key to display that file. To return to the drawing mode, press the break key. To recall the previous display, type in LT.

Once you've executed DC, you can recall the catalog without accessing the disk by typing in DO.

You can also load from or save to tape. Have the tape running and type in TS or TL. Don't press the break key during tape operation; the program will bomb.

The Display program lets you view graphics without invoking the main Graph program; from DOS level, type in DISPLAY FILE NAME.

Continued on p. 50

System Requirements

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48K RAM
Disk Basic
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LOAD 80

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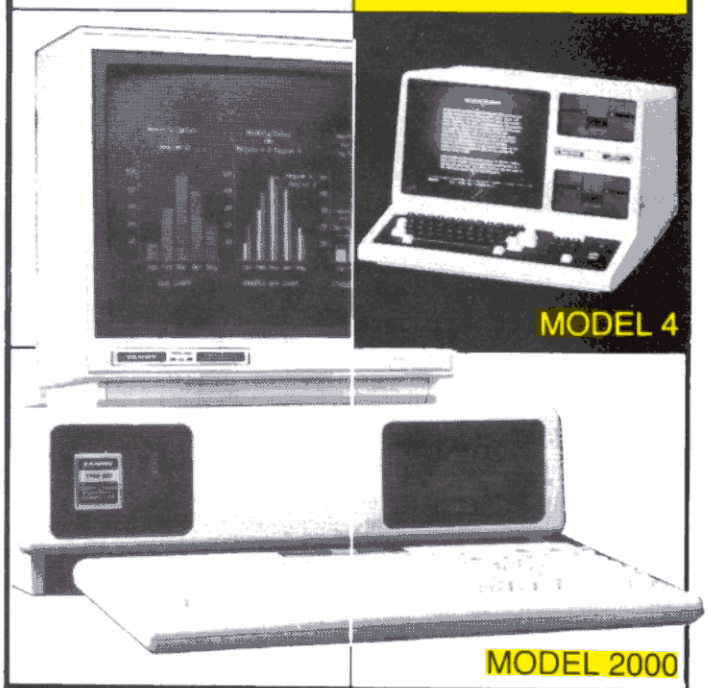

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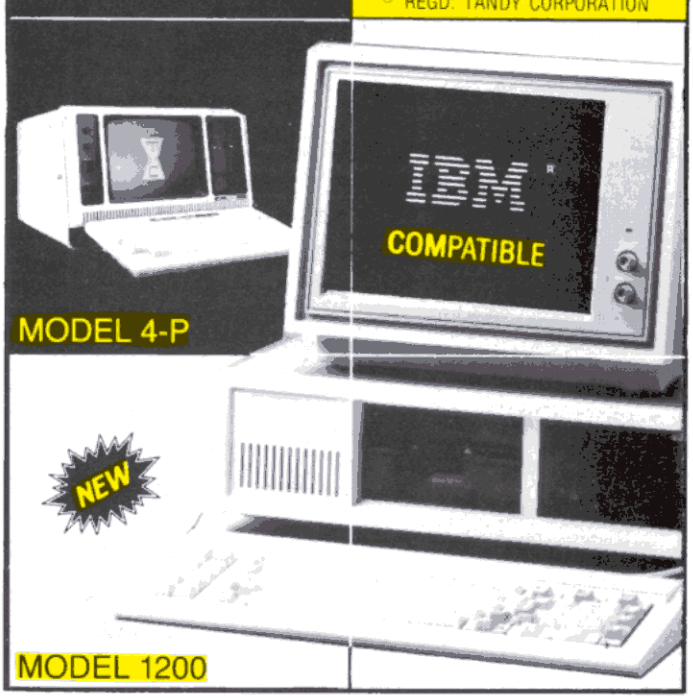

Continued from p. 46

Moving Parts

Graph lets you store portions of a screen display and reproduce them anywhere you want. To do so, you must outline what you want to save, so position the cursor next to that part of the screen. Press either shift key, followed by a number key from 1–5 to assign the illustration a number. Then draw your outline; a flashing line marks the boundaries of the image you want saved. Unless you're extremely nimble with the arrow keys, slow down the cursor for this operation.

When you've completed your outline, press the enter key. Within a few seconds, Graph stores all pixels within the outlines to the number key you specified.

You can display the stored image as-is, or you can reproduce it with different black/white configurations. Start with the cursor above the spot where you want to reproduce the image. Then press a shift key, followed by one of these letter combinations: PW to display all white pixels stored, PB to display all black pixels stored, NW for a white negative version of PW, NB for a black negative version of PB, B for an all-black image, W for all-white.

After you type in the appropriate letter or letters, press the number key corresponding to the stored image (1–5). For example, to display all the black pixels saved to the 1 key, press the shift key, then type in PB1.

Figure 4 illustrates the shift key function. The letter G in the Graph logo (see Fig. 1) was outlined and saved to the 1 key, then reproduced in each of Graph's black/white configurations. The key combinations for displaying each of the figures, from upper left to bottom right, are the shift key and PW1, PB1, NW1, NB1, B1, and W1.

The shift key function saves you the trouble of redrawing a repeated image. For example, to incorporate numbers and letters into your graphics, you could create a character set and save it in a disk file; when you need a particular character, you can store it using the shift key and display it in your new design.

Graph Extras

Three of Graph's routines are Basic programs that you invoke by pressing X followed by a number. X1 transfers control to a menu-driven routine that draws circles; you can set the circle's diameter and position on the screen. Pressing X2 displays a help screen listing Graph's commands. X3 calls a program that rotates a display or creates an explosion effect. It takes several minutes to perform rotation or explosion and the screen may go black before Graph begins drawing the new display. Figure 5 shows the Graph logo after suffering an explosion with a diameter of 6.

Printed Matter

You can print screen displays in 28 sizes. When you press P, Graph prompts you for the type of printer, Radio Shack (press R) or Epson (press E). Radio Shack printers must have dot-addressable graphics; Epsons or Epson-compatibles should have the Graftrax feature.

Now you can select the printout's size. Press S for a small picture followed by 1, 2, or 3 depending on the number of identical pictures you want to print. For a medium-sized picture press M; press L for a large one.

If you press D, you can define your own pixel size. Type in a number from 1–4 to define width and a number from 1–7 for length. Figure 6 shows a medium-sized printout of a picture; in Fig. 7, pixels are defined as 3,6; in Fig. 8 as 1,4. ■

Michael Leibow (age 18) is studying computer engineering at the Rochester Institute of Technology in New York. He is a self-taught programmer who writes mostly in machine language. You can contact him at 2361 Beachwood Blvd., Beachwood, OH 44122.

Program Listing 1. Graph/SRC.

```
00100          ORG     7000H
00110 CPYWTE   DEFM    '(c) 1984'
00120 START    DI
00130          CALL    INTIAL
00140          LD      A,(HL)
00150          CP      13
00160          JP      Z,BFRE
00170          PUSH    HL
00180 ADDEXT   INC     HL
00190          LD      A,(HL)
00200          CP      13
00210          JP      NZ,ADDEXT
00220          CALL    EXTENS
00230          POP     HL
00240          CALL    LDFRST
00250          LD      HL,BUFFS
00260          LD      DE,TEMPSC
00270          LD      BC,1024
00280          LDIR
00290          CALL    INTRO
00300          CALL    LOAD
00310          JP      LOOP
00320 BFRE     CALL    PRPARE
00330          CALL    INTRO
00340          CALL    WHITE
00350          JP      LOOP
00360 PRPARE   LD      HL,BUFFS
00370          LD      DE,1024
00380 PRP1     LD      A,(HL)
00390          ADD     A,70
00400          LD      (HL),A
00410          INC     HL
00420          DEC     DE
00430          LD      A,D
00440          OR      E
00450          JP      NZ,PRP1
00460          RET
00470 INTRO    LD      HL,BUFFS
00480          LD      DE,3C00H
00490          LD      BC,1024
00500 INT1     LD      A,(DE)
00510          CP      (HL)
00520          JP      Z,INT2
00530          INC     A
00540          LD      (DE),A
00550 INT2     INC     DE
00560          DEC     BC
00570          INC     HL
00580          LD      A,B
00590          OR      C
00600          JP      NZ,INT1
00610          LD      BC,1024
00620          LD      HL,BUFFS
00630          LD      DE,3C00H
00640 INT3     LD      A,(DE)
00650          CP      (HL)
00660          JP      NZ,INTRO
00670          INC     HL
00680          INC     DE
00690          DEC     BC
00700          LD      A,B
00710          OR      C
00720          JP      NZ,INT3
00730 INT4     CALL    NEGATI
00740          LD      HL,AUTH
00750          LD      DE,16321
00760          LD      BC,61
00770          LDIR
00780          LD      BC,10000
00790          CALL    WASTE
00800          CALL    ENTER
00810          JP      Z,INT4
00820          RET
00830 LOOP     DI
00840          LD      A,(3880H)
00850          OR      A
00860          CALL    NZ,NEWKEY
00870          LD      A,(14400)
00880          SUB     128
00890          JP      M,MAIN
00900 REPIX    LD      A,(14400)
00910          BIT     7,A
00920          JP      NZ,REPIX
00930          LD      A,(YY)
00940          LD      D,A
00950          LD      A,(XX)
00960          LD      E,A
00970          PUSH    DE
00980          CALL    TEST
00990          POP     DE
01000          JP      Z,REPIX1
01010          CALL    RESET
01020          JP      LOOP1
01030 REPIX1   CALL    SET
01040          JP      LOOP1
01050 MAIN     ADD     A,128
01060          CP      4
01070          CALL    Z,ADVAN
01080          CALL    ROUTNS
01090          JP      LOOP1
01100 ROUTNS   CP      8
01110          CALL    Z,UP
01120          CP      16
01130          CALL    Z,DOWN
01140          CP      32
01150          CALL    Z,LEFT
01160          CP      40
01170          CALL    Z,NW
01180          CP      48
01190          CALL    Z,SW
01200          CP      64
01210          CALL    Z,RIGHT
01220          CP      72
01230          CALL    Z,NE
01240          CP      80
01250          CALL    Z,SE
```

Listing 1 continued

Listing 1 continued

```
01260          RET
01270 LOOP1    CALL    BLINK
01280          CALL    002BH
01290          OR      A
01300          JP      Z,LOOP
01310          CP      87
01320          CALL    Z,WHITE
01330          CP      67
01340          CALL    Z,CLS
01350          CP      82
01360          CALL    Z,RND
01370          CP      31H
01380          CALL    Z,SLOWER
01390          CP      32H
01400          CALL    Z,FASTER
01410          CP      84
01420          CALL    Z,TAPE
01430          CP      83
01440          CALL    Z,SAVEP
01450          CP      78
01460          CALL    Z,NEGATI
01470          CP      68
01480          CALL    Z,DISK
01490          CP      76
01500          CALL    Z,LDTORP
01510          CP      45H
01520          CALL    Z,EXCHA
01530          CP      48H
01540          CALL    Z,HORIZ
01550          CP      56H
01560          CALL    Z,VERT
01570          CP      50H
01580          CALL    Z,LPRINT
01590          CP      4BH
01600          CALL    Z,KEEP
01610          CP      4DH
01620          CALL    Z,MODE
01630          CP      51H
01640          CALL    Z,PLAID
01650          CP      42H
01660          CALL    Z,BKWRD
01670          CP      55H
01680          CALL    Z,UPDOWN
01690          CP      49H
01700          CALL    Z,INTIAL
01710          CP      88
01720          CALL    Z,UTIL
01730          CP      '/'
01740          CALL    Z,UTIL2
01750          CP      44
01760          CALL    Z,ORIGIN
01770          CP      46
01780          CALL    Z,LINE
01810          JP      LOOP
01820 SLOWER   LD      HL,(HOWFAS)
01830          LD      BC,500
01840          XOR     A
01850          SBC     HL,BC
01860          RET     C
01870          LD      (HOWFAS),HL
01880          RET
01890 FASTER   LD      HL,(HOWFAS)
01900          LD      BC,500
01910          ADD     HL,BC
01920          RET     C
01930          LD      (HOWFAS),HL
01940          RET
01950 TAPE     CALL    002BH
01960          OR      A
01970          JP      Z,TAPE
01980          CALL    SAVE
01990          CP      83
02000          JP      Z,TSAVE
02010          CP      76
02020          JP      Z,TLOAD
02030          LD      A,(14400)
02040          CP      4
02050          JP      Z,BREAK
02060          JP      TAPE
02070 TSAVE    LD      HL,4211H
02080          LD      (HL),1
02090          CALL    0287H
02100          LD      BC,1024
02110          LD      HL,3C00H
02120 TLOOP    LD      A,(HL)
02130          CALL    0264H
02140          LD      A,(14400)
02150          CP      4
02160          JP      Z,BREAK
02170          INC     HL
02180          DEC     BC
02190          LD      A,B
02200          OR      C
02210          JP      NZ,TLOOP
02220          CALL    01F8H
02230          JP      CLRRET
02240 TLOAD    LD      HL,4211H
02250          LD      (HL),1
02260          CALL    0296H
02270          LD      HL,3C00H
02280          LD      BC,1024
02290 TLOOP1   CALL    0235H
02300          LD      (HL),A
02310          LD      A,(14400)
02320          CP      4
02330          JP      Z,BREAK
02340          INC     HL
02350          DEC     BC
02360          LD      A,B
02370          OR      C
02380          JP      NZ,TLOOP1
02390          CALL    01F8H
02400          JP      CLRRET
02410 INTIAL   PUSH    HL
02420          LD      IX,KEY1
02430          CALL    INIT1
02440          LD      IX,KEY2
02450          CALL    INIT1
02460          LD      IX,KEY3
02470          CALL    INIT1
02480          LD      IX,KEY4
02490          CALL    INIT1
02500          LD      IX,KEY5
02510          CALL    INIT1
02520          LD      HL,BUFLAS
02530          LD      (HL),255
02540          LD      DE,BUFLAS+1
02550          LD      BC,1152
02560          LDIR
02570          LD      HL,NEWBUF
02580          LD      DE,NEWBUF+1
02590          LD      BC,999
02600          LD      (HL),255
02610          LDIR
02620          JP      POPHRT
02630 INIT1    LD      (IX),0
02640          LD      (IX+1),128
02650          LD      (IX+2),6
02660          PUSH    IX
02670          POP     HL
02680          LD      DE,3
02690          ADD     HL,DE
02700          LD      (HL),255
02710          PUSH    HL
02720          POP     DE
02730          INC     DE
02740          LD      BC,1149
02750          LDIR
02760          RET
02770 WHITE    LD      HL,3C00H
02780          LD      (HL),191
02790          LD      DE,3C01H
02800          LD      BC,1023
02810          LDIR
02820          RET
02830 ENTER    LD      A,(14400)
02840          BIT     0,A
02850          RET     Z
02860 ENT1     LD      A,(14400)
02870          BIT     0,A
02880          JP      NZ,ENT1
02890          INC     A
02900          RET
02910 BLINK    LD      A,(YY)
02920          LD      D,A
02930          LD      A,(XX)
02940          LD      E,A
02950          CALL    TEST
02960          JP      Z,OFFF
02970 ONN      LD      A,(YY)
02980          LD      D,A
02990          LD      A,(XX)
03000          LD      E,A
03010          CALL    RESET
03020          LD      BC,500H
03030          CALL    WASTE
03040          LD      A,(YY)
03050          LD      D,A
03060          LD      A,(XX)
03070          LD      E,A
03080          CALL    SET
03090          RET
03100 OFFF     LD      A,(YY)
03110          LD      D,A
03120          LD      A,(XX)
03130          LD      E,A
03140          CALL    SET
03150          LD      BC,500H
03160          CALL    WASTE
03170          LD      A,(YY)
03180          LD      D,A
03190          LD      A,(XX)
```

Listing 1 continued

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```
03200          LD      E,A
03210          CALL    RESET
03220          RET
03230 ORIGIN   LD      A,(XX)
03240          LD      (X1),A
03250          LD      A,(YY)
03260          LD      (Y1),A
03270          JP      CLRRET
03280 LINE     LD      A,(X1)
03290          INC     A
03300          RET     Z
03310 LINE1    LD      A,(14400)
03320          CP      4
03330          JP      Z,BREAK
03340          CALL    2BH
03350          OR      A
03360          JP      Z,LINE1
03370          CALL    SAVE
03380          CP      'W'
03390          JP      Z,LINEW
03400          CP      'B'
03410          JP      Z,LINEB
03420          JP      LINE1
03430 LINEW    LD      A,1
03440 L1       LD      (LMODE),A
03450          JP      L2
03460 LINEB    LD      A,2
03470          JP      L1
03480 L2       LD      A,(X1)
03490          LD      DE,WORD1
03500          CALL    MULT
03510          LD      A,(Y1)
03520          LD      DE,WORD2
03530          CALL    MULT
03540          LD      A,(XX)
03550          LD      DE,WORD3
03560          CALL    MULT
03570          LD      A,(YY)
03580          LD      DE,WORD4
03590          CALL    MULT
03600          LD      HL,(WORD1)
03610          LD      DE,(WORD3)
03620          OR      A
03630          SBC     HL,DE
03640          CALL    DIVIDE
03650          LD      L,A
03660          LD      H,B
03670          LD      (DX),HL
03680          LD      HL,(WORD2)
03690          LD      DE,(WORD4)
03700          OR      A
03710          SBC     HL,DE
03720          CALL    DIVIDE
03730          LD      L,A
03740          LD      H,B
03750          LD      (DY),HL
03760 L3       LD      HL,(WORD1)
03770          LD      DE,(DX)
03780          OR      A
03790          SBC     HL,DE
03800          LD      (WORD1),HL
03810          CALL    DIVIDE
03820          PUSH    AF
03830          LD      HL,(WORD2)
03840          LD      DE,(DY)
03850          OR      A
03860          SBC     HL,DE
03870          LD      (WORD2),HL
03880          CALL    DIVIDE
03890          LD      D,A
03900          POP     AF
03910          LD      E,A
03920          LD      A,(LMODE)
03930          DEC     A
03940          JP      Z,L4
03950          CALL    RESET
03960          JP      L5
03970 L4       CALL    SET
03980 L5       LD      HL,(WORD3)
03990          LD      DE,(WORD1)
04000          RST     18H
04010          JP      NZ,L3
04020          LD      HL,(WORD4)
04030          LD      DE,(WORD2)
04040          RST     18H
04050          JP      NZ,L3
04060          RET
04070 MULT     LD      B,7
04080          LD      L,A
04090          LD      H,0
04100 MULT1    ADD     HL,HL
04110          DJNZ    MULT1
04120          LD      A,L
04130          LD      (DE),A
04140          LD      A,H
04150          INC     DE
04160          LD      (DE),A
04170          RET
04180 DIVIDE   LD      A,L
04190          LD      L,H
04200          LD      H,0
04210          SLA     L
04220          BIT     7,A
04230          JP      Z,DIV1
04240          INC     L
04250 DIV1     LD      A,L
04260          BIT     7,A
04270          JP      NZ,DIV2
04280          LD      B,0
04290          RET
04300 DIV2     LD      B,0FFH
04310          RET
04320 EXCHA    CALL    SAVE
04330          CALL    LOADP
04340          LD      HL,TEMPSC
04350          LD      DE,SCREEN
04360          LD      BC,1024
04370          LDIR
04380          RET
04390 CLS      LD      HL,3C00H
04400          LD      (HL),128
04410          LD      DE,3C01H
04420          LD      BC,1023
04430          LDIR
04440          RET
04450 MODE     LD      A,(BB)
04460          DEC     A
04470          JP      Z,MODE1
04480          DEC     A
04490          JP      Z,MODE2
04500          JP      MODE1
04510 MODE2    LD      A,1
04520          JP      MODEND
04530 MODE1    LD      A,2
04540 MODEND   LD      (BB),A
04550          RET
04560 KEEP     LD      A,(BB)
04570          DEC     A
04580          JP      Z,KEEP1
04590          DEC     A
04600          JP      Z,KEEP1
04610          DEC     A
04620          JP      Z,KEEP2
04630 KEEP1    LD      A,3
04640          JP      MODEND
04650 KEEP2    LD      A,4
04660          JP      MODEND
04670 HORIZ    LD      A,179
04680          CALL    ODDL
04690          LD      A,140
04700          CALL    EVENL
04710          JP      CLRRET
04720 PLAID    LD      A,153
04730          CALL    ODDL
04740          LD      A,166
04750          CALL    EVENL
04760          JP      CLRRET
04770 EVENL    LD      (TEMA),A
04780          LD      HL,15424
04790          LD      DE,64
04800          LD      B,8
04810          PUSH    DE
04820          JP      GLINE
04830 ODDL     LD      (TEMA),A
04840          LD      HL,15360
04850          LD      DE,64
04860          LD      B,8
04870          PUSH    DE
04880 GLINE    LD      A,(TEMA)
04890          OR      (HL)
04900          LD      (HL),A
04910          INC     HL
04920          DEC     DE
04930          LD      A,D
04940          OR      E
04950          JP      NZ,GLINE
04960          POP     DE
04970          ADD     HL,DE
04980          PUSH    DE
04990          DJNZ    GLINE
05000          POP     DE
05010          RET
05020 VERT     LD      A,149
05030          CALL    ODDL
05040          LD      A,149
05050          CALL    EVENL
05060          JP      CLRRET
05070 BKWRD    CALL    SAVE
05080          XOR     A
05090 BKSTT    LD      (XXX),A
05100          XOR     A
05110          LD      (YYY),A
05120 BKCONT   LD      A,(14400)
05130          CP      4
05140          JP      Z,BREAK
05150          LD      A,(YYY)
05160          LD      D,A
05170          LD      A,(XXX)
05180          LD      E,A
05190          CALL    TEST
05200          JP      NZ,BKSET
05210          LD      HL,BKBUFF
05220          LD      A,(YYY)
05230          LD      E,A
05240          LD      D,0
05250          ADD     HL,DE
05260          XOR     A
05270          LD      (HL),A
05280          JP      BKCON0
05290 BKSET    LD      HL,BKBUFF
05300          LD      A,(YYY)
05310          LD      E,A
05320          LD      D,0
05330          ADD     HL,DE
05340          LD      A,1
05350          LD      (HL),A
05360 BKCON0   LD      A,(YYY)
05370          INC     A
05380          CP      48
05390          JP      Z,BKCON1
05400          LD      (YYY),A
05410          JP      BKCONT
05420 BKCON1   XOR     A
05430          LD      (YYY),A
05440 BKCON2   LD      A,(XXX)
05450          LD      B,A
05460          LD      A,127
05470          SUB     B
05480          LD      E,A
05490          LD      A,(YYY)
05500          LD      D,A
05510          CALL    TEST
05520          PUSH    AF
05530          LD      A,(XXX)
05540          LD      E,A
05550          LD      A,(YYY)
05560          LD      D,A
05570          POP     AF
05580          JP      NZ,BKSET1
05590          CALL    RESET
05600          JP      BKCON3
05610 BKSET1   CALL    SET
05620 BKCON3   LD      HL,BKBUFF
05630          LD      A,(YYY)
05640          LD      C,A
05650          LD      B,0
05660          ADD     HL,BC
05670          LD      A,(HL)
05680          OR      A
05690          PUSH    AF
05700          LD      A,(XXX)
05710          LD      B,A
05720          LD      A,127
05730          SUB     B
05740          LD      E,A
05750          LD      A,(YYY)
05760          LD      D,A
05770          POP     AF
05780          JP      NZ,BKSET2
05790          CALL    RESET
05800          JP      BKCON4
05810 BKSET2   CALL    SET
05820 BKCON4   LD      A,(YYY)
05830          INC     A
05840          CP      48
05850          JP      Z,BKCON5
05860          LD      (YYY),A
05870          JP      BKCON2
05880 BKCON5   LD      A,(XXX)
05890          INC     A
05900          CP      64
05910          RET     Z
05920          JP      BKSTT
05930 UPDOWN   CALL    SAVE
05940          XOR     A
05950 UPSTT    LD      (YYY),A
05960          XOR     A
05970          LD      (XXX),A
05980 UPCONT   LD      A,(14400)
05990          CP      4
06000          JP      Z,BREAK
06010          LD      A,(YYY)
06020          LD      D,A
06030          LD      A,(XXX)
06040          LD      E,A
06050          CALL    TEST
06060          JP      NZ,UPSET
06070          LD      HL,BKBUFF
06080          LD      A,(XXX)
```

Listing 1 continued

```
06090          LD      E,A
06100          LD      D,0
06110          ADD     HL,DE
06120          XOR     A
06130          LD      (HL),A
06140          JP      UPCON0
06150 UPSET    LD      HL,BKBUFF
06160          LD      A,(XXX)
06170          LD      E,A
06180          LD      D,0
06190          ADD     HL,DE
06200          LD      A,1
06210          LD      (HL),A
06220 UPCON0   LD      A,(XXX)
06230          INC     A
06240          CP      128
06250          JP      Z,UPCON1
06260          LD      (XXX),A
06270          JP      UPCONT
06280 UPCON1   XOR     A
06290          LD      (XXX),A
06300 UPCON2   LD      A,(YYY)
06310          LD      B,A
06320          LD      A,47
06330          SUB     B
06340          LD      D,A
06350          LD      A,(XXX)
06360          LD      E,A
06370          CALL    TEST
06380          PUSH    AF
06390          LD      A,(XXX)
06400          LD      E,A
06410          LD      A,(YYY)
06420          LD      D,A
06430          POP     AF
06440          JP      NZ,UPSET1
06450          CALL    RESET
06460          JP      UPCON3
06470 UPSET1   CALL    SET
06480 UPCON3   LD      HL,BKBUFF
06490          LD      A,(XXX)
06500          LD      C,A
06510          LD      B,0
06520          ADD     HL,BC
06530          LD      A,(HL)
06540          OR      A
06550          PUSH    AF
06560          LD      A,(YYY)
06570          LD      B,A
06580          LD      A,47
06590          SUB     B
06600          LD      D,A
06610          LD      A,(XXX)
06620          LD      E,A
06630          POP     AF
06640          JP      NZ,UPSET2
06650          CALL    RESET
06660          JP      UPCON4
06670 UPSET2   CALL    SET
06680 UPCON4   LD      A,(XXX)
06690          INC     A
06700          CP      128
06710          JP      Z,UPCON5
06720          LD      (XXX),A
06730          JP      UPCON2
06740 UPCON5   LD      A,(YYY)
06750          INC     A
06760          CP      24
06770          RET     Z
06780          JP      UPSTT
06790 UTIL     CALL    2BH
06800          OR      A
06810          JP      Z,UTIL
06820          CALL    SAVE
06830          CP      31H
06840          JP      Z,UTIL1
06850          CP      32H
06860          JP      Z,UTIL2
06870          CP      33H
06880          JP      Z,UTIL3
06890          LD      A,(14400)
06900          CP      4
06910          JP      Z,BREAK
06920          JP      UTIL
06930 UTIL1    LD      HL,AUTIL1
06940 UTILX    PUSH    HL
06950          CALL    SAVPIC
06960          POP     HL
06970          POP     AF
06980          JP      4299H
06990 UTIL2    LD      HL,AUTIL2
07000          JP      UTILX
07010 UTIL3    LD      HL,AUTIL3
07020          JP      UTILX
07030 SAVPIC   LD      HL,TEMPIC
```

Listing 1 continued

Circle 176 on Reader Service card.

FILE TRANSFER
+ Conversion Utilities

Products For NEW AT

APPLE
TRS
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IBM PC/XT, JR. $129.95
Tandy 1000, 1200, 2000 .. $129.95
IBM AT $224.95

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- Basic, Fortran, Cobol
- ASCII files, data files
- Word processing files

IBM PC/XT, Jr. ⟷ Tandy 2000 ..... $129.95
DISK Transporter transfers files back and forth, includes utilities.

New Yellow Disks
DS/DD $2 ea. (20 min.)

New Products for **IBM AT** or compatibles
Drives, 360 KB $275.00
Prototype Boards & Extender Cards ..... $120.00 ea.
Serial Cables (6ft.) $85

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Circle 216 on Reader Service card.

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TRS-80+ MOD I, III, COCO, TI99/4a
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Four Drive Cable		39.95
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Circle 534 on Reader Service card.

EXPAND TRS-80 MEMORY

TRS-80 to 16K, 32K, or 48K

**Model 1 = From 4K-16K Requires (1) One Kit
Model 3 = From 4K-48K Requires (3) Three Kits
Color = From 4K-16K Requires (1) Kit

**Model 1 equipped with Expansion Board up to 48K Two Kits Required
– One Kit Required for each 16K of Expansion –

TRS-16K3 200ns for Color & Model III. . . . $8.95
TRS-16K4 250ns for Model I. $6.95

TRS-80 Color 32K or 64K Conversion Kit

Easy to install kits come complete with 8 ea. 4164-2 (200ns) 64K dynamic RAMs and conversion documentation. Converts TRS-80 color computers with D, E, ET, F and NC circuit boards to 32K. Also converts TRS-80 color computer II to 64K. Flex DOS or OS-9 required to utilize full 64K RAM on all computers.

TRS-64K2. . . . . $38.95

NEW! TRS-80 Model IV 64K or 128K Conversion Kit

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TRS-64K2. . . . . $38.95
(Converts the Model IV from 16K to 64K or will expand the Model 4P from 64K to 128K)

TRS-64K2PAL (Model IV only). $59.95
(8-4164's with PAL Chip to expand from 64K to 128K)

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SSDD=Single Sided Double Density • DSDD=Double Sided Double Density

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5S1-3 Evaluates 7 critical steps. **$37.95**

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• Attractive, functional disk storage system • 36 (3", 3.25" and 3.5"), 50 (8") or 75 (5¼") disk storage capacity • Easy filing and retrieving • Protects disk from dust contamination • Molded from durable smoked plastic with front carrying handle • Size (DM36): 8⅝"L x 5½"W x 4⅞"D • Size (DM50 & DM75): 7"W x 6½"H x 9¼"D • Weight: 2 lbs.

Part No.	Description	Price
DM36	Stores 36 (3", 3.25" and 3.5") Diskettes. . . .	$19.95 ea.
DM75	Stores 75 (5¼") Diskettes.	$19.95 ea.
DM50	Stores 50 (8") Diskettes.	$29.95 ea.

We also specialize in integrated circuits, custom cables, power supplies, keyboards, and much, much more! Give us a call today!

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Listing 1 continued

```
07040          LD      DE,DCB
07050          LD      BC,9
07060          LDIR
07070          CALL    DSAVE
07080          RET
07090 AUTIL1   DEFM    'BASIC UTIL1/BAS -F:0 -M:61439'
07100          DEFB    0DH
07110 AUTIL2   DEFM    'BASIC UTIL2/BAS -F:0 -M:61439'
07120          DEFB    0DH
07130 AUTIL3   DEFM    'BASIC UTIL3/BAS'
07140          DEFB    0DH
07150 SAVE     LD      HL,3C00H
07160          LD      DE,TEMPSC
07170          LD      BC,1024
07180          LDIR
07190          RET
07200 SAVEP    LD      HL,3C00H
07210          LD      DE,SCREEN
07220          LD      BC,1024
07230          LDIR
07240          RET
07250 NEGATI   LD      HL,3C00H
07260          LD      BC,1024
07270 AGAIN    LD      A,(HL)
07280          CPL
07290          SET     7,A
07300          RES     6,A
07310          LD      (HL),A
07320          INC     HL
07330          DEC     BC
07340          LD      A,B
07350          OR      C
07360          JP      NZ,AGAIN
07370          RET
07380 RIGHT1   LD      A,127
07390          LD      (XX),A
07400          JP      ALMOST
07410 LEFT1    XOR     A
07420          LD      (XX),A
07430          JP      ALMOST
07440 DOWN1    LD      A,47
07450          LD      (YY),A
07460          JP      ALMOST
07470 UP1      XOR     A
07480          LD      (YY),A
07490          JP      ALMOST
07500 DISK     CALL    002BH
07510          OR      A
07520          JP      Z,DISK
07530          CALL    SAVE
07540          CP      'S'
07550          JP      Z,UHOH
07560          CP      'L'
07570          JP      Z,UHOH
07580          CP      'C'
07590          JP      Z,DDIREC
07600          CP      'O'
07610          JP      Z,DD1
07620          LD      A,(14400)
07630          CP      4
07640          JP      Z,BREAK
07650          JP      DISK
07660 UHOH     LD      (TEMA),A
07670          LD      B,23
07680          LD      HL,DCB
07690          CALL    0040H
07700          JP      C,BREAK
07710          PUSH    BC
07720          CALL    LOAD
07730          POP     BC
07740          LD      HL,DCB
07750          LD      C,B
07760          LD      B,0
07770          ADD     HL,BC
07780          CALL    EXTENS
07790          LD      HL,3C00H
07800          LD      A,(TEMA)
07810          CP      83
07820          JP      Z,DSAVE
07830          CP      76
07840          JP      Z,DLOAD
07850          RET
07860 LOAD     LD      HL,TEMPSC
07870          LD      DE,3C00H
07880          LD      BC,1024
07890          LDIR
07900          RET
07910 LDTORP   CALL    2BH
07920          OR      A
07930          JP      Z,LDTORP
07940          CP      'T'
07950          JP      Z,LOAD
07960          CP      'P'
07970          JP      Z,LOADP
07980          LD      A,(14400)
07990          CP      4
```

Listing 1 continued

Circle 204 on Reader Service card.

DiskCount Data

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```
08000          JP      NZ,LDTORP
08010          CALL    SAVE
08020          JP      BREAK
08030 LOADP    LD      HL,SCREEN
08040          LD      DE,3C00H
08050          LD      BC,1024
08060          LDIR
08070          JP      CLRRET
08080 RND      LD      HL,3C00H
08090          LD      BC,1024
08100 HELLO    LD      D,127
08110          LD      A,R
08120 MIKE     INC     D
08130          SUB     4
08140          JP      P,MIKE
08150          LD      (HL),D
08160          INC     HL
08170          DEC     BC
08180          LD      A,B
08190          OR      C
08200          JR      NZ,HELLO
08210          RET
08220 LDFRST   LD      DE,DCB
08230          LD      BC,24
08240          LDIR
08250          CALL    SAVE
08260          LD      HL,BUFFS
08270          CALL    DLOAD
08280          OR      A
08290          JP      NZ,LDFR1
08300          RET
08310 LDFR1    POP     HL
08320          JP      BFRE
08330 DSAVE    LD      DE,DCB
08340          LD      HL,BUFFER
08350          LD      BC,0
08360          CALL    4420H
08370          OR      A
08380          JP      NZ,DERR1
08390          LD      HL,3C00H
08400          CALL    DSAVE1
08410          LD      HL,15616
08420          CALL    DSAVE1
08430          LD      HL,15872
08440          CALL    DSAVE1
08450          LD      HL,16128
08460          CALL    DSAVE1
08470          LD      DE,DCB
08480          CALL    4428H
08490          JP      CLRRET
08500 DSAVE1   LD      DE,BUFFER
08510          LD      BC,256
08520          LDIR
08530          LD      DE,DCB
08540          CALL    4439H
08550          OR      A
08560          JP      NZ,DERR
08570          RET
08580 DERR     POP     HL
08590 DERR1    PUSH    AF
08600          CALL    LOAD
08610          JP      POPART
08620 DLOAD    LD      (WORD1),HL
08630          LD      HL,BUFFER
08640          LD      DE,DCB
08650          LD      BC,0
08660          CALL    4424H
08670          OR      A
08680          JP      NZ,DERR1
08690          LD      HL,(WORD1)
08700          DEC     H
08710          LD      (WORD1),HL
08720          LD      B,4
08730 DL1      PUSH    BC
08740          LD      DE,DCB
08750          CALL    4436H
08760          OR      A
08770          JP      NZ,DERR
08780          LD      HL,BUFFER
08790          LD      DE,(WORD1)
08800          INC     D
08810          LD      (WORD1),DE
08820          LD      BC,256
08830          LDIR
08840          POP     BC
08850          DJNZ    DL1
08860          LD      DE,DCB
08870          CALL    4428H
08880          JP      CLRRET
08890 DD1      LD      HL,CBUFF
08900          JP      DD2
08910 DDIREC   CALL    CLS
08920          LD      HL,ADCAT
08930          LD      DE,15880
08940          LD      BC,(ADCAT1)
08950          LDIR
08960          LD      HL,CBUFF
08970          LD      BC,0
08980          CALL    4290H
08990 DD2      PUSH    HL
09000          CALL    CLS
09010          POP     HL
09020 DDLOOP   PUSH    HL
09030          POP     IX
09040          LD      BC,0FFFFH
09050          CALL    SEARCH
09060          LD      A,(HL)
09070          CP      'G'
09080          JP      NZ,DDNEXT
09090          INC     HL
09100          LD      A,(HL)
09110          CP      'R'
09120          JP      NZ,DDNEXT
09130          INC     HL
09140          LD      A,(HL)
09150          CP      'A'
09160          JP      NZ,DDNEXT
09170          PUSH    IX
09180          POP     HL
09190          LD      A,(DDSCRE)
09200          LD      E,A
09210          LD      A,(DDSCRE+1)
09220          LD      D,A
09230          LDIR
09240          LD      HL,(DDSCRE)
09250          LD      DE,16
09260          ADD     HL,DE
09270          LD      (DDSCRE),HL
09280          LD      A,(DDCOUN)
09290          INC     A
09300          LD      (DDCOUN),A
09310 DDNEXT   LD      A,(IX+22)
09320          CP      '+'
09330          JP      Z,DDEND
09340          CP      'A'
09350          JP      C,DDEND
09360          CP      'Z'+1
09370          JP      NC,DDEND
09380          PUSH    IX
09390          POP     HL
09400          LD      DE,21
09410          ADD     HL,DE
09420          LD      D,0
09430          LD      A,(TEMA)
09440          LD      E,A
09450          ADD     HL,DE
09460          XOR     A
09470          LD      (TEMA),A
09480          JP      DDLOOP
09490 DDEND    LD      HL,3C00H
09500          LD      (DDSCRE),HL
09510          LD      A,(DDCOUN)
09520          OR      A
09530          JP      Z,LOAD
09540 DDFIND   CALL    FLASH
09550          LD      A,(14400)
09560          OR      A
09570          JP      Z,DDFIND
09580          CP      4
09590          CALL    Z,DDEND1
09600          CP      8
09610          CALL    Z,DDUP
09620          CP      16
09630          CALL    Z,DDDOWN
09640          CP      32
09650          CALL    Z,DDLEFT
09660          CP      64
09670          CALL    Z,DDRITE
09680          CP      1
09690          JP      Z,DDFOUN
09700          JP      DDFIND
09710 ADCAT    DEFM    'Please wait
a moment'
09720 ADCAT1   DEFW    $-ADCAT
09730 FLASH    PUSH    HL
09740          PUSH    HL
09750          LD      DE,CBUFF
09760          LD      BC,8
09770          LDIR
09780          POP     HL
09790          PUSH    HL
09800          POP     DE
09810          INC     DE
09820          LD      (HL),80H
09830          LD      BC,7
09840          LDIR
09850          LD      BC,10000
09860          CALL    WASTE
09870          POP     DE
09880          PUSH    DE
09890          LD      HL,CBUFF
09900          LD      BC,8
09910          LDIR
09920          LD      BC,9500
09930          CALL    WASTE
09940          JP      POPHRT
09950 DDUP     PUSH    HL
09960          LD      DE,64
09970          OR      A
09980          SBC     HL,DE
09990 DDUP2    LD      A,H
10000          CP      3CH
10010          JP      C,DDUP1
10020 DDUP3    LD      A,(HL)
10030          CP      80H
10040          JP      Z,DDUP1
10050          POP     DE
10060          RET
10070 DDUP1    JP      POPHRT
10080 DDDOWN   PUSH    HL
10090          LD      DE,64
10100          ADD     HL,DE
10110 DDOWN1   LD      A,H
10120          CP      40H
10130          JP      NC,DDUP1
10140          JP      DDUP3
10150 DDLEFT   PUSH    HL
10160          LD      DE,16
10170          OR      A
10180          SBC     HL,DE
10190          JP      DDUP2
10200 DDRITE   PUSH    HL
10210          LD      DE,16
10220          ADD     HL,DE
10230          JP      DDOWN1
10240 DDFOUN   LD      DE,DCB
10250          LD      BC,10
10260          LDIR
10270          LD      HL,DCB
10280 DDFLOP   LD      A,(HL)
10290          INC     HL
10300          CP      80H
10310          JP      NZ,DDFLOP
10320          DEC     HL
10330          CALL    EXTENS
10340          LD      HL,3C00H
10350          LD      (DDSCRE),HL
10360          XOR     A
10370          LD      (DDCOUN),A
10380          JP      DLOAD
10390 EXTENS   LD      (HL),'/'
10400          INC     HL
10410          LD      (HL),'G'
10420          INC     HL
10430          LD      (HL),'R'
10440          INC     HL
10450          LD      (HL),'A'
10460          INC     HL
10470          LD      (HL),0DH
10480          RET
10490 DDEND1   POP     HL
10500          JP      BREAK
10510 SEARCH   LD      A,(HL)
10520          INC     HL
10530          INC     BC
10540          CP      ':'
10550          JP      NZ,SEARCH
10560          LD      DE,4
10570          OR      A
10580          SBC     HL,DE
10590          PUSH    HL
10600          PUSH    BC
10610          POP     HL
10620          OR      A
10630          SBC     HL,DE
10640          PUSH    HL
10650          POP     BC
10660          POP     HL
10670          DEC     HL
10680          LD      A,(HL)
10690          CP      '/'
10700          CALL    Z,DDFSET
10710          INC     HL
10720          RET
10730 DDFSET   LD      A,1
10740          LD      (TEMA),A
10750          RET
10760 UP       LD      A,(YY)
10770          DEC     A
10780          LD      (YY),A
10790          CP      -1
10800          JP      Z,LEFT
10810          JP      ALMOST
10820 DOWN     LD      A,(YY)
10830          INC     A
10840          LD      (YY),A
```

Listing 1 continued

```
10850          CP      48
10860          JP      Z,RIGHT
10870          JP      ALMOST
10880 LEFT     LD      A,(XX)
10890          DEC     A
10900          LD      (XX),A
10910          CP      -1
10920          JP      Z,UP
10930          JP      ALMOST
10940 RIGHT    LD      A,(XX)
10950          INC     A
10960          LD      (XX),A
10970          CP      128
10980          JP      Z,DOWN
10990          JP      ALMOST
11000 NW       LD      HL,XX
11010          DEC     (HL)
11020          LD      HL,YY
11030          DEC     (HL)
11040          JP      ALMOST
11050 SW       LD      HL,XX
11060          DEC     (HL)
11070          LD      HL,YY
11080          INC     (HL)
11090          JP      ALMOST
11100 NE       LD      HL,XX
11110          INC     (HL)
11120          LD      HL,YY
11130          DEC     (HL)
11140          JP      ALMOST
11150 SE       LD      HL,XX
11160          INC     (HL)
11170          LD      HL,YY
11180          INC     (HL)
11190 ALMOST   LD      A,(XX)
11200          CP      254
11210          JP      NC,RIGHT1
11220          CP      128
11230          JP      NC,LEFT1
11240          LD      A,(YY)
11250          CP      254
11260          JP      NC,DOWN1
11270          CP      48
11280          JP      NC,UP1
11290          LD      A,(YY)
11300          LD      D,A
11310          LD      A,(XX)
11320          LD      E,A
11330          LD      A,(BB)
11340          DEC     A
11350          JP      Z,SETRE
11360          DEC     A
11370          JP      Z,RERES
11380          PUSH    AF
11390          CALL    TEST
11400          PUSH    AF
11410          LD      A,(XX)
11420          LD      E,A
11430          LD      A,(YY)
11440          LD      D,A
11450          POP     BC
11460          POP     AF
11470          DEC     A
11480          JP      NZ,KEEP3
11490          PUSH    BC
11500          POP     AF
11510          JP      Z,RERES
11520          JP      SETRE
11530 KEEP3    PUSH    BC
11540          POP     AF
11550          JP      Z,SETRE
11560          JP      RERES
11570 SETRE    CALL    SET
11580          JP      WAIT
11590 RERES    CALL    RESET
11600          JP      WAIT
11610 RESET    LD      A,86H
11620          JP      STORE
11630 SET      LD      A,0C6H
11640          JP      STORE
11650 TEST     LD      A,46H
11660 STORE    LD      (BYTE+1),A
11670          LD      A,D
11680          LD      B,-1
11690 LOOP5    INC     B
11700          SUB     3
11710          JP      NC,LOOP5
11720          ADD     A,3
11730          SLA     A
11740          LD      C,A
11750          LD      L,B
11760          LD      H,0
11770          LD      B,6
11780 LOOP6    ADD     HL,HL
11790          DJNZ    LOOP6
11800          LD      D,0
11810          SRL     E
11820          JP      NC,THORT
11830          INC     C
11840 THORT    ADD     HL,DE
11850          LD      DE,3C00H
11860          ADD     HL,DE
11870          SLA     C
11880          SLA     C
11890          SLA     C
11900          LD      A,(BYTE+1)
11910          ADD     A,C
11920          LD      (BYTE+1),A
11930          BIT     7,(HL)
11940          JP      Z,CHANGE
11950 BYTE     DEFB    0CBH
11960          DEFB    0
11970          RET
11980 WAIT     LD      BC,(HOWFAS)
11990          CALL    WASTE
12000          RET
12010 WASTE    DEC     BC
12020          LD      A,B
12030          OR      C
12040          JP      NZ,WASTE
12050          RET
12060 BUFFER   DEFS    256
12070 DCB      DEFS    51
12080 SCREEN   DEFS    1024
12090 TEMPSC   DEFS    1024
12100 XX       DEFB    61
12110 YY       DEFB    21
12120 BB       DEFB    2
12130 X1       DEFB    255
12140 Y1       DEFB    255
12150 DY       DEFW    0
12160 DX       DEFW    0
12170 WORD1    DEFW    0
12180 WORD2    DEFW    0
12190 WORD3    DEFW    0
12200 WORD4    DEFW    0
12210 LMODE    DEFB    0
12220 BKBUFF   DEFS    128
12230 CBUFF    DEFS    1761
12240 DDSCRE   DEFW    3C00H
12250 DDCOUN   DEFW    0
12260 TEMPIC   DEFM    'TEMP/GRA'
12270          DEFB    0DH
12280 HOWFAS   DEFW    1001
12290 BUFFS    DEFM    '::::::::::::::::'
12300          DEFM    '::::::::::::::::'
12310          DEFM    '::::::::::::::::'
12320          DEFM    '::::::::::::::::'
12330          DEFM    '::::::::::::::::'
12340          DEFM    '::::::::::::::::'
12350          DEFM    '::::::::::::::::'
12360          DEFM    '::::::::::::::::'
12370          DEFM    '::::::::::::ZjjFF'
12380          DEFM    '===EGv::::::::::'
12390          DEFM    ':y=====gJ:bY==y:'
12400          DEFM    ':jVFfN::::::::::'
12410          DEFM    '::::::::::T=:::j'
12420          DEFM    'vvJ::=w::::::::::'
12430          DEFM    ':y::yA:ZYbY;::rA:'
12440          DEFM    'x;::dO::::::::::'
12450          DEFM    '::::::::::T:::tyy'
12460          DEFM    'yyyyyyQ===En::::'
12470          DEFM    ':y::ZjVAZX?:bQ:j'
12480          DEFM    'uO:bX?::::::::::'
12490          DEFM    '::::::::::O:::iyy'
12500          DEFM    'yyyyyyO:dy:<w:rA'
12510          DEFM    '=y::tO:rA::BIFFI'
12520          DEFM    ':::eO::::::::::'
12530          DEFM    '::::::::::o:::dyy'
12540          DEFM    'IIIIIIiO::::::EY;:'
12550          DEFM    ':<^:yZt?::::::::'
12560          DEFM    '::bQ::::::::::::'
12570          DEFM    '::::::::::DN::<EI'
12580          DEFM    'FFf::dO::bn::::Z'
12590          DEFM    'xn:Cyy::::vFfN::'
12600          DEFM    '::dO::::::::::::'
12610          DEFM    '::::::::::=gjJ::'
12620          DEFM    '::d::dO::dY;::Zr'
12630          DEFM    'Fn::<Q::jX;::Enj'
12640          DEFM    'J::En::::::::::'
12650          DEFM    '::::::::::::<===='
12660          DEFM    '================;'
12670          DEFM    ':e::Q==;::::::<'
12680          DEFM    '=GFFI::::::::::'
12690          DEFM    '::::VFFFFFFFFFFFF'
12700          DEFM    'FFFFFFFFFFFFFFFF'
12710          DEFM    'FH::GFFFFFFFFFFF'
12720          DEFM    'FFFFFN::::::::::'
12730          DEFM    '::::O:FFFFFFFFFFF'
12740          DEFM    'FFFFFFFFFFFFFFFF'
```

Listing 1 continued on p. 80

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A La CRT

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Operator Input

Figure 1 shows a sample menu from my program. I reserve the top line of the CRT screen for communications, which includes the operator's menu selection as well as prompt and error messages (see Fig. 1a). Program Listing 1 accepts all data from the operator, and it has multiple entry points. The program receives keyboard input as an INKEY$ command, and it checks to make sure the entered character is one of the menu options.

The subroutine performs three main tasks. First, line 20440 prints the prompt message WHICH? on the communications line and waits for a single-character response. (This prompt message is in variable W$.) If you want a different prompt, initialize W$ with the desired prompt and enter the subroutine at 20450. By merging Listing 1 with Program Listing 2, you can see how the subroutine works with a new prompt.

The subroutine's second function is to accept the operator's menu choice. The value of variable L% determines the maximum number of characters the routine accepts. Whenever you enter the maximum number of characters, an exit from the subroutine occurs automatically. The Input subroutine returns the expected response in variable Z$.

My subroutine has a standard maximum length of one character. However, you can use L% to create an INKEY$ routine loop that accepts more than one character. Initialize W$ with the prompt message and L% with the maximum length of the response, then enter the subroutine at line 20460.

Listing 1's third function is to check input for valid numeric data. If your response is to be numeric, initialize NU$ with N. This prohibits you from entering any character other than 0–9 or a period. Merge Program Listing 3 with Listing 1 to see the subroutine work with a number-only response.

The program also lets you use the backspace key for data entry, but it doesn't let you use keys not normally used in data entry, such as cursor controls or the clear key.

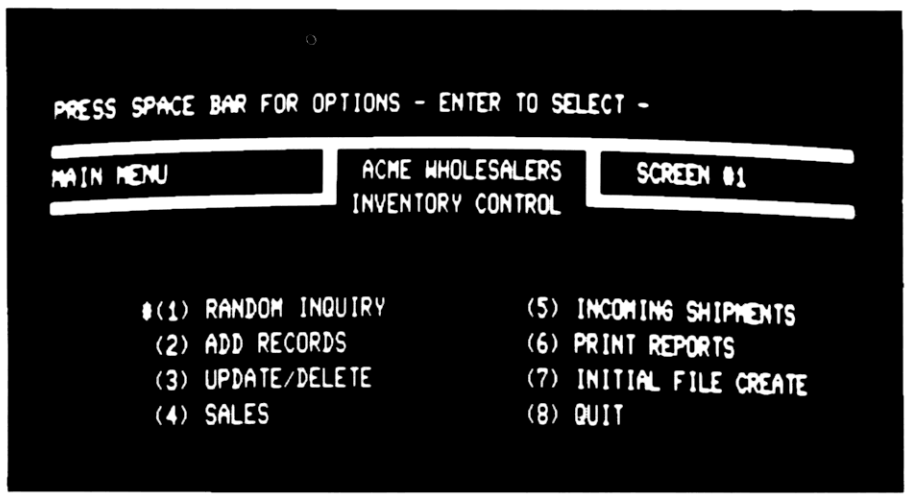

Photo 1. Screen photo of a menu with numeric options.

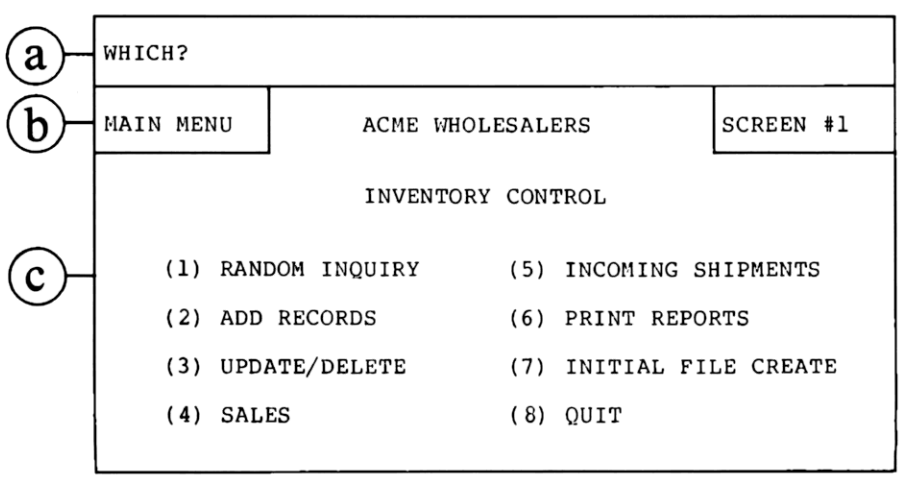

Figure 1. Sample menu. (a) The communications area. (b) Messages appear here; they seem to be outside the main screen. (c) The main body of the screen.

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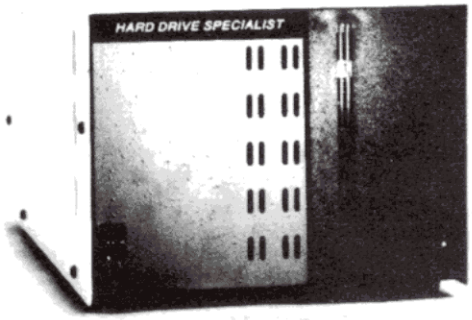

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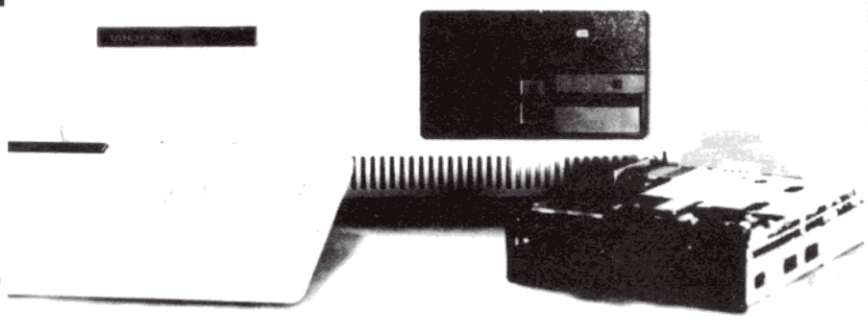

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Error Messages

Program Listing 4 uses the communications area of the screen to flash error messages of your choice. Variable E$ defines the message, and the subroutine flashes it five times. To use Listing 4, initialize E$ with the desired message and a GOSUB 20840 command. By merging Program Listing 5 with Listing 4, you can see the technique in action.

Screen Framing

To make messages more visible, the program prints them on top of a frame, which makes them appear outside the normal screen area (see Fig. 1b). Program Listing 6 creates this frame; you can change the frame's layout as you wish. To use the Frame subroutine, initialize the variables in Table 1 and execute a GOSUB 20130 command. Merge Program Listing 7 with Listing 6 to see my sample layout.

Listing 6 combines standard code and graphics required to produce a standard frame at the top of each screen. In the upper left box, the current function is identified (F$). In the upper right box, the screen number is identified (S%). The screen number provides a clear reference point for written documentation. The business name (B$) appears between the boxes. The program name (P$) appears directly beneath the business name.

You only have to initialize the business and program names at the start of the program; their values won't change. The framing area and the communications line take up the top four lines of the screen, leaving 12 lines for the main body. The main body usually starts with a main menu, as in Fig. 1c.

Variable	Definition
F$	Function name
B$	Business name
S%	Screen number
P$	Program name

Table. Variables used in Program Listing 6.

Menu Selection Techniques

The selection process usually determines the physical layout of a menu screen. The menu in Photo 1 is probably the most common type. One of the Selection routine's primary concerns is ease of operation. Program Listing 8 is a composite program incorporating the subroutines I've already described; it produces the screen shown in Photo 1.

In Listing 8, you select an option with one keystroke. (Remember the Input subroutine uses the INKEY$ option; you don't need to press the enter key for single-character entries.) This, however, presents a problem if you have more than nine options. You'd have to enter two digits, which is unacceptable to the standard INKEY$.

I've told you how to use loops to get around INKEY$'s preference for single-character input. Another alternative is to construct a menu with alphabetic options. The screen in Photo 2 is an example; notice that it has more entries than the screen in Photo 1. To use the alphabetics option, you can convert the alphabetic characters to numeric equivalents.

Each alphabetic character has an ASCII value equal to its numeric position in the alphabet, plus 64. Therefore, by subtracting 64 from the ASCII value of the alphabetic character, you'll have A = 1, B = 2, C = 3, and so on. The following instruction accomplishes this:

```
4200 ON ASC(Z$) - 64 GOTO
5000,6000,7000...
```

Program Listing 9 shows a complete menu preparation using the single alphabetic character for selection. This lets you select one of 26 options with a single keystroke.

You might prefer to have the alphabetic character represent the actual first character of the entry, as in Photo 3. This requires a minor addition to the selection process as listed in Program Listing 10. Note statements 4200–4400. Be careful not to duplicate the first characters in the menu.

The last selection method is selection by cursor movement (see Program Listing 11); you press the space bar to move the cursor from entry to entry.

The key to this routine is loading the screen address into an array and using the array subscript as the entry point. This menu selection technique requires more keystrokes; however, its advantages include ease of training and increased accuracy in entry selection.

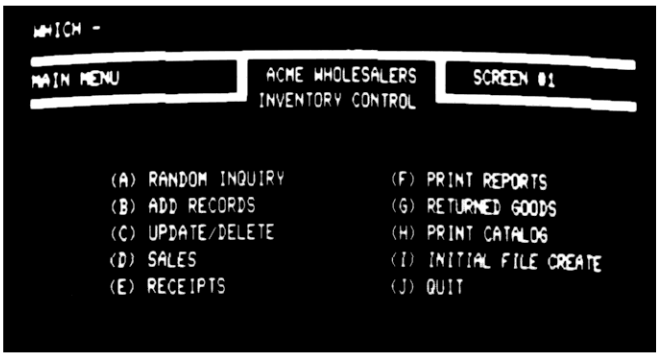

Photo 2. Screen photo of a menu with alphabetic options.

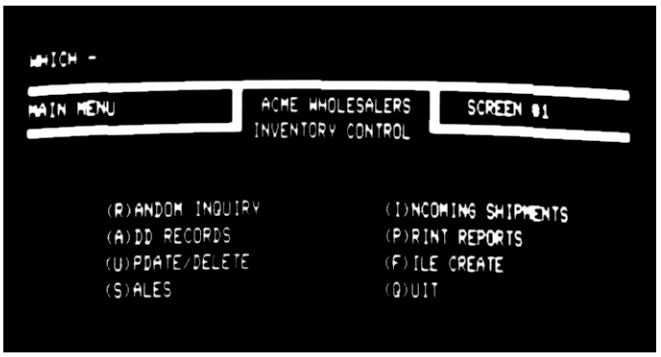

Photo 3. Screen photo of a menu with first-character options.

To make the most efficient use of the three subroutines (Listings 1, 4, and 6), I've stored them in a program called Skeleton (Program Listing 12). Whenever I write a menu-driven program, I merely load Skeleton into memory. Then I can devote more time to building the unique part of the application around the subroutines.

Conversion

All listings run without modification on the Models I and III. Listings 1–5 and 7 run on the Model 4. With the modifications shown in Fig. 2, the remaining listings also run on the Model 4. ■

Write to Ken Schweim at 436 Mound Ave., Mankato, MN 56001.

Related Articles

Miller, Doug. "The Screen Writer," November 1984, p. 98. Creates Model I/III data input screens.

Wilde, Tim. "Versatile Input," September 1980, p. 98. Input Model I data with ease.

Shuken, Bob. "Dexterous Data Entry," December 1981, p. 280. Menu-generated Model I data entry routine.

LISTING 6

```
20140 PRINT @80, STRING$(80,140);
20150 PRINT @186, CHR$(191);
20160 PRINT @212, CHR$(191);
20170 PRINT @266, CHR$(191);
20180 PRINT @292, CHR$(191);
20190 PRINT @320, STRING$(27,131);
20200 PRINT @372, STRING$(28,131);
20220 PRINT @168, F$;
20230 PRINT @215, "SCREEN "; S%;
20240 PRINT @222, "#";
20260 PRINT @189+((20-LEN(B$))/2), B$;
20280 PRINT @269+((20-LEN(P$))/2), P$;
```

LISTING 8

```
2000 PRINT @416,"(1) RANDOM INQUIRY";
2020 PRINT @447,"(5) INCOMING SHIPMENTS";
2040 PRINT @496,"(2) ADD RECORDS";
2060 PRINT @527,"(6) PRINT REPORTS";
2080 PRINT @576,"(3) UPDATE/DELETE";
2100 PRINT @607,"(7) INITIAL FILE CREATE";
2120 PRINT @656,"(4) SALES";
2140 PRINT @687,"(8) QUIT";
```

LISTING 9

```
2000 PRINT @416,"(A) RANDOM INQUIRY";
2020 PRINT @447,"(F) PRINT REPORTS";
2040 PRINT @496,"(B) ADD RECORDS";
2060 PRINT @527,"(G) RETURNED GOODS";
2080 PRINT @576,"(C) UPDATE/DELETE";
2100 PRINT @607,"(H) PRINT CATALOG";
2120 PRINT @656,"(D) SALES";
2140 PRINT @687,"(I) INITIAL FILE CREATE";
2160 PRINT @736,"(E) RECEIPTS";
2180 PRINT @767,"(J) QUIT";
```

LISTING 10

```
2000 PRINT @416,"(R)ANDOM INQUIRY";
2020 PRINT @447,"(I)NCOMING SHIPMENTS";
2040 PRINT @496,"(A)DD RECORDS";
2060 PRINT @527,"(P)RINT REPORTS";
2080 PRINT @576,"(U)PDATE/DELETE";
2100 PRINT @607,"(F)ILE CREATE";
2110 PRINT @656,"(S)ALES";
2120 PRINT @687,"(Q)UIT";
```

LISTING 11

```
2000 PRINT @416,"(1) RANDOM INQUIRY";
2020 PRINT @447,"(5) INCOMING SHIPMENTS";
2040 PRINT @496,"(2) ADD RECORDS";
2060 PRINT @527,"(6) PRINT REPORTS";
2080 PRINT @576,"(3) UPDATE/DELETE";
2100 PRINT @607,"(7) INITIAL FILE CREATE";
2120 PRINT @656,"(4) SALES";
2140 PRINT @687,"(8) QUIT";
```

LISTING 12

```
20140 PRINT @80, STRING$(80,140);
20150 PRINT @186, CHR$(191);
20160 PRINT @212, CHR$(191);
20170 PRINT @266, CHR$(191);
20180 PRINT @292, CHR$(191);
20190 PRINT @320, STRING$(27,131);
20200 PRINT @372, STRING$(28,131);
20220 PRINT @168, F$;
20230 PRINT @215, "SCREEN "; S%;
20240 PRINT @222, "#";
20260 PRINT @189+((20-LEN(B$))/2), B$;
20280 PRINT @269+((20-LEN(P$))/2), P$;
```

Figure 2. Model 4 conversions for Program Listings 6 and 8–12.

Program Listing 1. Common input subroutine.

```
20350 REM ----------------------------
20355 REM COMMON INPUT SUBROUTINE
20360 REM ----------------------------
20440 W$="WHICH"
20450 L%=1
20460 PRINT @0,STRING$(60," ");
20480 PRINT @0,W$;
20500 PRINT @0+LEN(W$)+1,STRING$(L%,"-");
20520 PRINT @0+LEN(W$)+1,"";
20540 Z$="":Y$=""
20560 FOR I%=1 TO L%
20580 Y$=INKEY$:IF Y$=""GOTO 20580
20584 IF Y$=CHR$(13)GOTO 20770
20588 IF Y$=CHR$(8)GOTO 20610
20592 IF NU$ <> "N" GOTO 20605
20596 IF Y$=CHR$(46)GOTO 20605
20600 IF Y$<CHR$(48) OR Y$>CHR$(57)GOTO 20580
20605 IF Y$<CHR$(32) OR Y$>CHR$(122) Y$="":GOTO
      20580
20610 Z$=Z$+Y$
20620 PRINT @0+LEN(W$)+1,Z$;
20640 IF Y$ <> CHR$(8) GOTO 20760
20660 Z$=LEFT$(Z$,LEN(Z$)-2)
20680 PRINT @0+LEN(W$)+1,STRING$(63-LEN(W$)," ");
20690 PRINT @0+LEN(W$)+1,STRING$(L%,"-");
20700 PRINT @0+LEN(W$)+1,Z$;
20720 IF I%=1 GOTO 20580
20740 I%=I%-1
20750 GOTO 20580
20760 NEXT I%
20770 NU$=" "
20780 RETURN
```

End

Program Listing 2. Test program for Program Listing 1.

```
25 CLS
50 CLEAR 1000
1000 W$="ENTER TODAYS DATE MM/DD/YY"
1020 L%=8
1040 GOSUB 20460
1999 END
```

End

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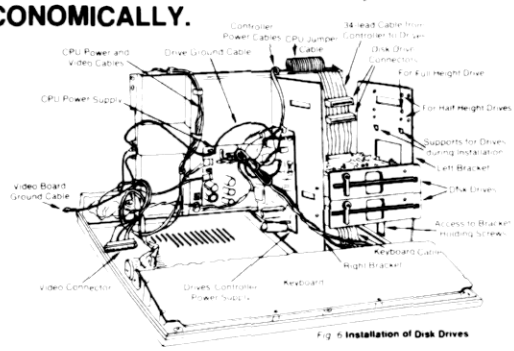

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Program Listing 3. Test program for Program Listing 1 that accepts only numeric input.

```
25 CLS
50 CLEAR 1000
1000 W$="ENTER SALES AMOUNT"
1020 L%=9
1040 NU$="N"
1060 GOSUB 20460
1999 END
```

End

Program Listing 4. Error flash subroutine.

```
20800 REM ---------------------------
20805 REM ERROR 'FLASH' SUBROUTINE
20810 REM ---------------------------
20840 FOR J%=1 TO 5
20845 PRINT @0,E$;
20850 FOR I%=1 TO 250:NEXT I%
20860 PRINT @0,STRING$(63," ");
20880 FOR I%=1 TO 150: NEXT I%
20890 NEXT J%
20920 RETURN
```

End

Program Listing 5. Test program for Program Listing 4.

```
25 CLS
50 CLEAR 1000
1000 E$="RESPONSE MUST BE 1 - 8"
1020 GOSUB 20840
1999 END
```

End

Program Listing 6. Screen framing subroutine.

```
20100 REM -----------------------------
20105 REM SCREEN 'FRAMING' SUBROUTINE
20110 REM -----------------------------
20130 CLS
20140 PRINT @64, STRING$(64,140);
20150 PRINT @85, CHR$(188);
20160 PRINT @106, CHR$(188);
20170 PRINT @149, CHR$(191);
20180 PRINT @170, CHR$(191);
20190 PRINT @192, STRING$(22,131);
20200 PRINT @234, STRING$(22,131);
20220 PRINT @128, F$;
20230 PRINT @174, "SCREEN "; S%;
20240 PRINT @181, "#";
20260 PRINT @150+((20-LEN(B$))/2), B$;
20280 PRINT @214+((20-LEN(P$))/2), P$;
20300 RETURN
```

End

Program Listing 7. Test program for Program Listing 6.

```
25 CLS
50 CLEAR 1000
1000 B$="ACME WHOLESALERS"
1020 P$="INVENTORY CONTROL"
1040 F$="INITIAL CREATE"
1060 S%=13
1080 GOSUB 20130
1999 END
```

End

Program Listing 8. Composite menu print routine.

```
100 CLS
500 CLEAR 1000
1000 B$="ACME WHOLESALERS"
1020 P$="INVENTORY CONTROL"
1040 F$="MAIN MENU"
1060 S%=1
1080 GOSUB 20130
2000 PRINT @392,"(1) RANDOM INQUIRY";
2020 PRINT @421,"(5) INCOMING SHIPMENTS";
2040 PRINT @456,"(2) ADD RECORDS";
2060 PRINT @485,"(6) PRINT REPORTS";
2080 PRINT @520,"(3) UPDATE/DELETE";
2100 PRINT @549,"(7) INITIAL FILE CREATE";
```

Listing 8 continued

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2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKEVN	Breakeven analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWITH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDVAL	Value of a bond
30 DEPLETE	Depletion analysis
31 BLACKSH	Black Scholes options analysis
32 STOCVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model-i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEUE1	Single server queueing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPROF	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQUOQ	Fixed quantity economic order quantity model
53 FQEOWSH	As above but with shortages permitted
54 FQEOQPB	As above but with quantity price breaks
55 QUEUECB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAP1	Cap. Asset Pr. Model analysis of project
59 WACC	Weighted average cost of capital
60 COMPBAL	True rate on loan with compensating bal. required
61 DISCBAL	True rate on discounted loan
62 MERGANAL	Merger analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
68 TIMETR	Time series analysis linear trend
69 TIMEMOV	Time series analysis moving average trend
70 FUPRINF	Future price estimation with inflation
71 MAILPAC	Mailing list system
72 LETWRT	Letter writing system-links with MAILPAC
73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSBUD	DOME business bookkeeping system
77 TIMECLCK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TIMUSAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign.
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
87 SELLPR	Computes selling price for given after tax amount
88 ARBCOMP	Arbitrage computations
89 DEPRSF	Sinking fund depreciation
90 UPSZONE	Finds UPS zones from zip code
91 ENVELOPE	Types envelope including return address
92 AUTOEXP	Automobile expense analysis
93 INSFILE	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
96 LOANAFFD	Loan amount a borrower can afford
97 RENTPRCH	Purchase price for rental property
98 SALELEAS	Sale-leaseback analysis
99 RRCONVBD	Investor's rate of return on convertable bond
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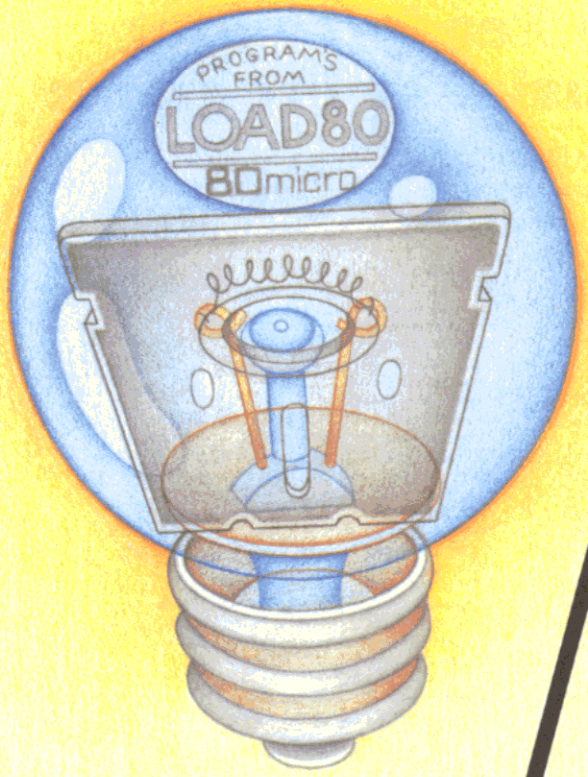

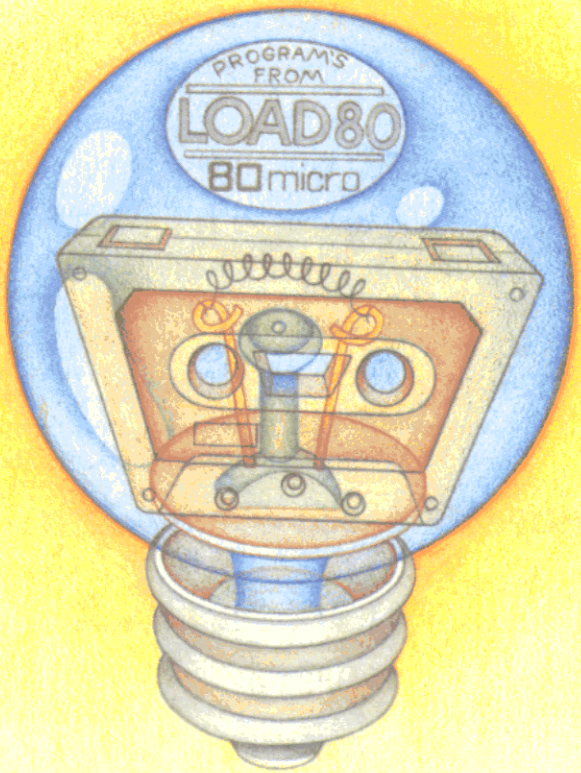

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Listing 8 continued

```
2120 PRINT @584,"(4) SALES";
2140 PRINT @613,"(8) QUIT";
2160 NU$="N"
3000 GOSUB 20440
4100 IF VAL(Z$)<1 GOTO 4500
4200 ON VAL(Z$) GOTO 5000,6000,7000,8000,9000,10000,11000,12000
4500 E$="RESPONSE MUST BE NUMBER 1-8"
4520 GOSUB 20840
4540 GOTO 3000
5000 STOP:REM (RANDOM INQUIRY ROUTINE)
6000 STOP:REM (ADD RECORDS ROUTINE)
7000 STOP:REM (UPDATE/DELETE ROUTINE)
8000 STOP:REM (SALES ROUTINE)
9000 STOP:REM (INCOMING SHIPMENTS ROUTINE)
10000 STOP:REM (PRINT REPORTS ROUTINE)
11000 STOP:REM (INITIAL FILE CREATE ROUTINE)
12000 STOP:REM (QUIT ROUTINE)
19999 END
```

End

Program Listing 9. Composite menu print routine using alphabetics.

```
100 CLS
500 CLEAR 1000
1000 B$="ACME WHOLESALERS"
1020 P$="INVENTORY CONTROL"
1040 F$="MAIN MENU"
1060 S%=1
1080 GOSUB 20130
2000 PRINT @392,"(A) RANDOM INQUIRY";
2020 PRINT @421,"(F) PRINT REPORTS";
2040 PRINT @456,"(B) ADD RECORDS";
2060 PRINT @485,"(G) RETURNED GOODS";
2080 PRINT @520,"(C) UPDATE/DELETE";
2100 PRINT @549,"(H) PRINT CATALOG";
2120 PRINT @584,"(D) SALES";
2140 PRINT @613,"(I) INITIAL FILE CREATE";
2160 PRINT @648,"(E) RECEIPTS";
2180 PRINT @677,"(J) QUIT";
3000 GOSUB 20440
4100 IF Z$<"A" GOTO 4500
4200 ON ASC(Z$)-64 GOTO 5000,6000,7000,8000,9000,10000,11000,120
00,13000,14000
4500 E$="RESPONSE MUST BE A-J"
4520 GOSUB 20840
4540 GOTO 3000
5000 STOP:REM (RANDOM INQUIRY ROUTINE)
6000 STOP:REM (ADD RECORDS ROUTINE)
7000 STOP:REM (UPDATE/DELETE ROUTINE)
8000 STOP:REM (SALES ROUTINE)
9000 STOP:REM (RECEIPTS ROUTINE)
10000 STOP:REM (PRINT REPORTS ROUTINE)
11000 STOP:REM (RETURNED GOODS  ROUTINE)
12000 STOP:REM (PRINT CATALOG ROUTINE)
13000 STOP:REM (INTITIAL FILE CREATE ROUTINE)
14000 STOP:REM (QUIT ROUTINE)
19999 END
```

End

Program Listing 10. Composite menu print routine using first characters.

```
100 CLS
500 CLEAR 1000
1000 B$="ACME WHOLESALERS"
1020 P$="INVENTORY CONTROL"
1040 F$="MAIN MENU"
1060 S%=1
1080 GOSUB 20130
2000 PRINT @392,"(R)ANDOM INQUIRY";
2020 PRINT @421,"(I)NCOMING SHIPMENTS";
2040 PRINT @456,"(A)DD RECORDS";
2060 PRINT @485,"(P)RINT REPORTS";
2080 PRINT @520,"(U)PDATE/DELETE";
2100 PRINT @549,"(F)ILE CREATE";
2110 PRINT @584,"(S)ALES";
2120 PRINT @613,"(Q)UIT";
3000 GOSUB 20440
4200 S$ = "RAUSIPFQ"
4220 FOR I%=1 TO LEN(S$)
4240 IF MID$(S$,I%,1)=Z$ GOTO 4400
4260 NEXT I%
4280 E$="INVALID RESPONSE"
4300 GOSUB 20840
4320 GOTO 3000
4400 ON I% GOTO 5000,6000,7000,8000,9000,10000,11000,12000
4500 E$="RESPONSE MUST BE A - J"
4520 GOSUB 20840
4540 GOTO 3000
```

Listing 10 continued

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Listing 10 continued

```
5000 STOP:REM (RANDOM INQUIRY ROUTINE)
6000 STOP:REM (ADD RECORDS ROUTINE)
7000 STOP:REM (UPDATE/DELETE ROUTINE)
8000 STOP:REM (SALES ROUTINE)
9000 STOP:REM (INCOMING SHIPMENTS ROUTINE)
10000 STOP:REM (PRINT REPORTS ROUTINE)
11000 STOP:REM (INITIAL FILE CREATE ROUTINE)
12000 STOP:REM (QUIT  ROUTINE)
19999 END
```

End

Program Listing 11. Composite menu print routine using cursor selection.

```
25 CLS
50 CLEAR 1000
100 DIM P(8)
120 FOR I%=1 TO 8
140 READ P(I%)
160 NEXT I%
180 DATA 392,456,520,584,421,485,549,613
200 W$="PRESS SPACE BAR FOR OPTIONS - ENTER TO SELECT"
1000 B$="ACME WHOLESALERS"
1020 P$="INVENTORY CONTROL"
1040 F$="MAIN MENU"
1060 S%=1
1080 GOSUB 20130
2000 PRINT @392,"(1) RANDOM INQUIRY";
2020 PRINT @421,"(5) INCOMING SHIPMENTS";
2040 PRINT @456,"(2) ADD RECORDS";
2060 PRINT @485,"(6) PRINT REPORTS";
2080 PRINT @520,"(3) UPDATE/DELETE";
2100 PRINT @549,"(7) INITIAL FILE CREATE";
2120 PRINT @584,"(4) SALES";
2140 PRINT @613,"(8) QUIT";
3000 FOR M%=1 TO 8
3020 PRINT @P(M%)-1,"*";
3040 GOSUB 20450
3060 IF Z$="" GOTO 4000
3070 PRINT @P(M%)-1," ";
```

Listing 11 continued

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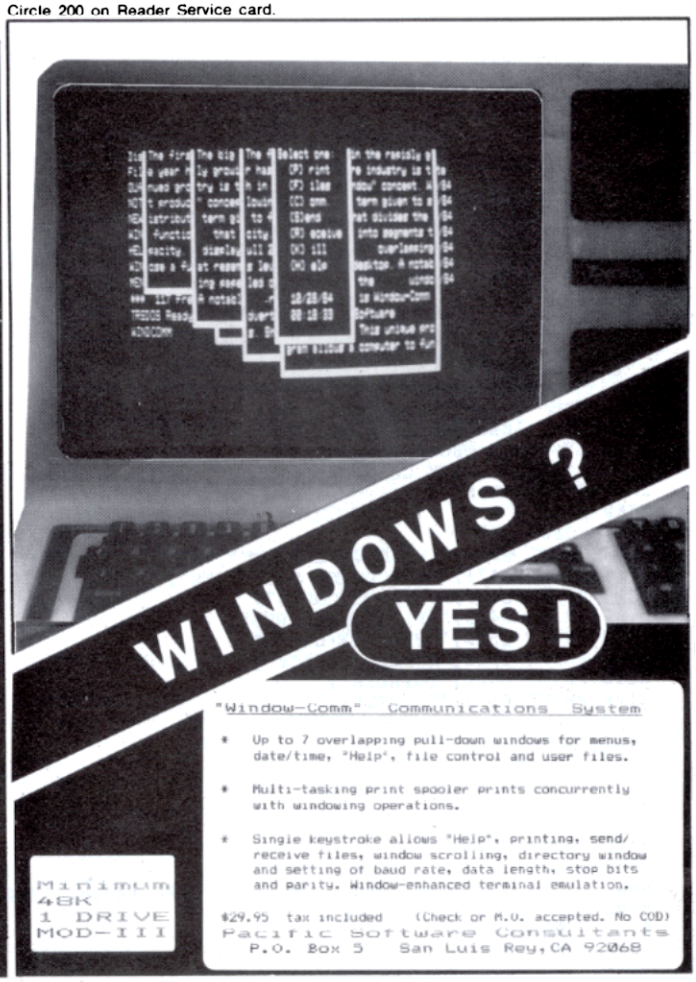

Listing 11 continued

```
3080 NEXT M%
3100 GOTO 3000
4000 ON M% GOTO 5000,6000,7000,8000,9000,10000,
11000,12000
4200 S$="RAUSIPFQ"
4220 FOR I%=1 TO LEN(S$)
4240 IF MID$(S$,I%,1)=Z$ GOTO 4400
4260 NEXT I%
4280 E$="INVALID RESPONSE"
4300 GOSUB 20840
4320 GOTO 3000
4400 ON I% GOTO 5000,6000,7000,8000,9000,10000,
11000,12000
4500 E$="RESPONSE MUST BE A - J"
4520 GOSUB 20840
4540 GOTO 3000
5000 STOP:REM (RANDOM INQUIRY ROUTINE)
6000 STOP:REM (ADD RECORDS ROUTINE)
7000 STOP:REM (UPDATE/DELETE ROUTINE)
8000 STOP:REM (SALES ROUTINE)
9000 STOP:REM (INCOMING SHIPMENTS ROUTINE)
10000 STOP:REM (PRINT REPORTS ROUTINE)
11000 STOP:REM (INITIAL FILE CREATE ROUTINE)
12000 STOP:REM (QUIT ROUTINE)
19999 END
20100 REM ------------------------------
20105 REM SCREEN 'FRAMING' SUBROUTINE
20110 REM ------------------------------
20130 CLS
20140 PRINT @64, STRING$(64,140);
20150 PRINT @85, CHR$(188);
20160 PRINT @106, CHR$(188);
20170 PRINT @149, CHR$(191);
20180 PRINT @170, CHR$(191);
20190 PRINT @192, STRING$(22,131);
20200 PRINT @234, STRING$(22,131);
20220 PRINT @128, F$;
20230 PRINT @174, "SCREEN "; S%;
20240 PRINT @181, "#";
20260 PRINT @150+((20-LEN(B$))/2), B$;
20280 PRINT @214+((20-LEN(P$))/2), P$;
20300 RETURN
20350 REM ---------------------------
20355 REM COMMON INPUT SUBROUTINE
20360 REM ---------------------------
20440 W$="WHICH"
20450 L%=1
20460 PRINT @0,STRING$(60," ");
20480 PRINT @0,W$;
20500 PRINT @0+LEN(W$)+1,STRING$(L%,"-");
20520 PRINT @0+LEN(W$)+1,"";
20540 Z$="":Y$=""
20560 FOR I%=1 TO L%
20580 Y$=INKEY$:IF Y$="" GOTO 20580
20584 IF Y$=CHR$(13) GOTO 20780
20588 IF Y$=CHR$(8) GOTO 20610
20592 IF NU$ <> "N" GOTO 20605
20596 IF Y$=CHR$(46) GOTO 20605
20600 IF Y$<CHR$(48) OR Y$>CHR$(57) GOTO 20580
20605 IF Y$<CHR$(32) OR Y$>CHR$(122) THEN Y$=""
:GOTO 20580
20610 Z$=Z$+Y$
20620 PRINT @0+LEN(W$)+1,Z$;
20640 IF Y$ <> CHR$(8) GOTO 20760
20660 Z$=LEFT$(Z$,LEN(Z$)-2)
20680 PRINT @0+LEN(W$)+1,STRING$(63-LEN(W$)," ");
20690 PRINT @0+LEN(W$)+1,STRING$(L%,"-");
20700 PRINT @0+LEN(W$)+1,Z$;
20720 IF I%=1 GOTO 20580
20740 I%=I%-1
20750 GOTO 20580
20760 NEXT I%
20770 NU$=" "
20780 RETURN
20800 REM ---------------------------
20805 REM ERROR 'FLASH' SUBROUTINE
20810 REM ---------------------------
20840 FOR J%=1 TO 5
20845 PRINT @0,E$;
20850 FOR I%=1 TO 250:NEXT I%
20860 PRINT @0,STRING$(63," ");
20880 FOR I%=1 TO 150: NEXT I%
20890 NEXT J%
20920 RETURN
```

End

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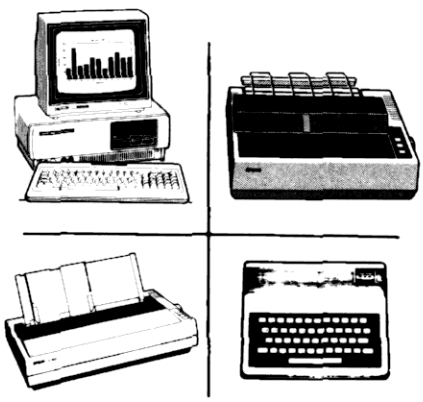

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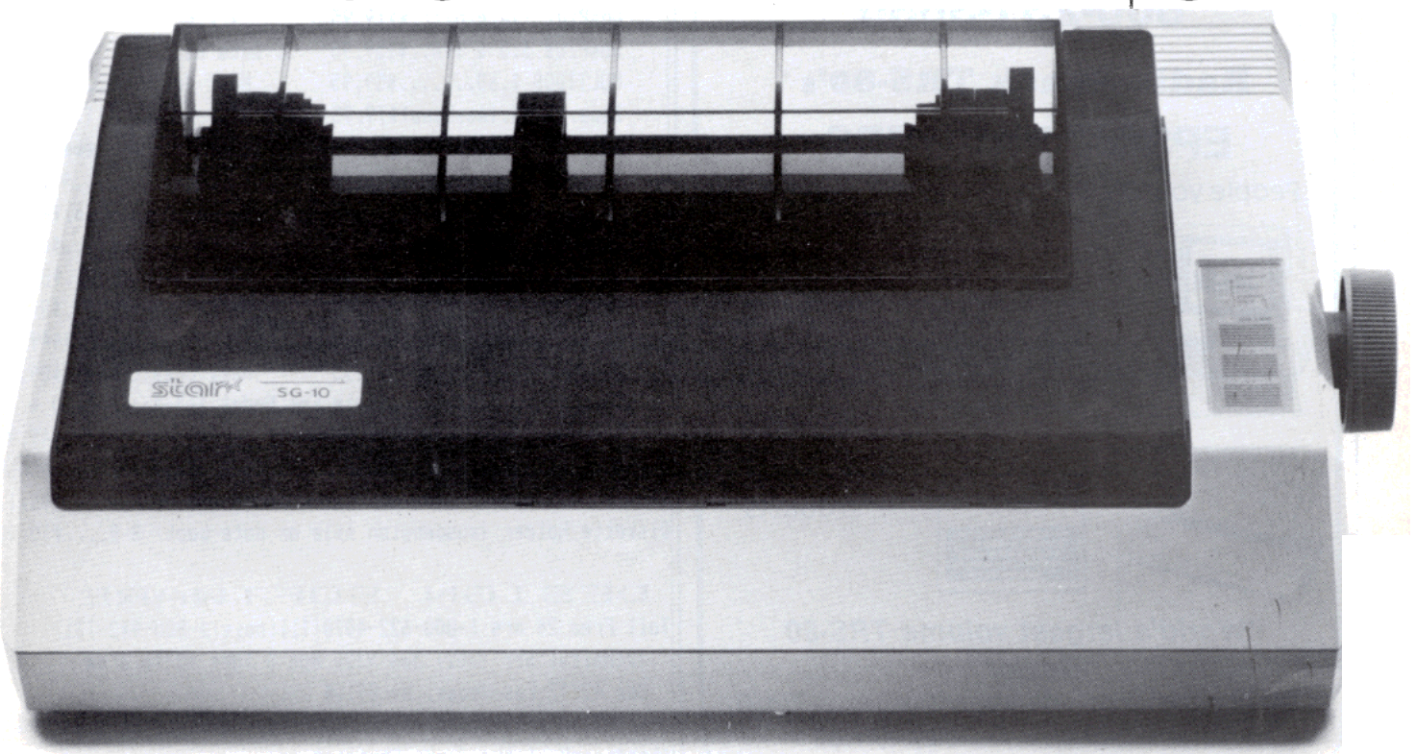

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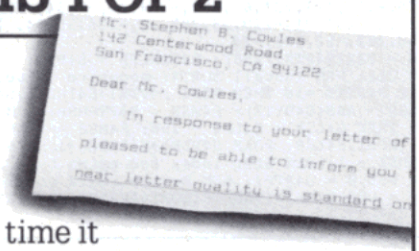

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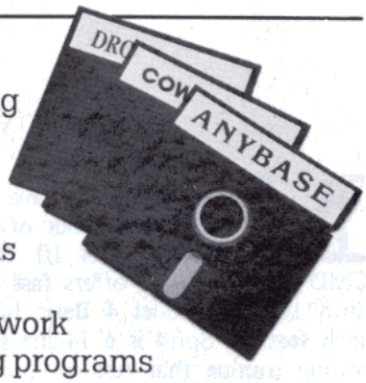

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Sorting It Out

To use Sort4, type in Program Listing 1 and save it to disk in ASCII format (SAVE "SORT4",A). Once it's on disk, all you have to do is merge the routine with an existing program or load it before writing a new program.

When you're working with Sort4, you must protect the RAM area above location 65,303, since Sort4 stores machine-language code from locations 65,304–65,535. To do so, load Basic from the DOS level by typing in BASIC (M = 65303).

Sort4 requires that you store strings for sorting in a string array named SORT4ARRAY$ with a subscript between 1 and whatever upper limit you select for the array. Note that the lowest subscript is 1, not zero, to accommodate programs that specify "option base 1" for array subscripts.

A defined function called SORT4$ controls access to Sort4 from anywhere in your program. You simply specify the number of strings you want sorted.

For example, assume you want to sort 150 strings of varying lengths. You'd dimension SORT4ARRAY$ (probably early in your program) with the statement DIM SORT4ARRAY$(150).

Store your 150 strings in the array as SORT4ARRAY$(1)–SORT4ARRAY$(150). Each string may contain from zero (a null string) to 255 characters.

When you're ready to sort, you need to write only one statement: DUMMY$ = FNSORT4$(150). The variable name dummy is just that, a dummy. You can substitute any string name; Z$ = FNSORT4$(150) works just as well. You can also use an integer variable for the number of strings; for example, if X% = 150, you could type in DUMMY$ = FNSORT4$(X%).

A Demonstration

So much for the theory—now you're ready to see the routine in action. Program Listing 2 demonstrates the sorting routine's speed and also checks the accuracy of your typing for Listing 1's data statements.

Assuming you've already saved Listing 1 to disk, load Basic as specified

Program Listing 1. Sort4 string-sorting routine.

```
1 S4PTR! = 65304!: REM Start of reserved area (232 bytes) for SORT4 code; must
                   load BASIC via "BASIC (M=65303)". This is highest possible
                   location, but can be lowered, as SORT4 is fully relocatable.
2 DATA 213,221,225,221,102,2,221,110,1,78,35,70,237,67,-229,35,78,35,70,237,67,
       -227,237,67,-217,237,75,-217,203,56,203,25,120,177,200,237,67,-217,33,1,
       0,34,-225,42,-227,183,237,66,34,-223,42,-225,34,-221,237,75,-217,9,34
3 DATA -219,42,-221,205,-184,229,221,225,42,-219,205,-184,229,253,225,221,126,0,
       183,40,98,253,126,0,183,40,40,221,190,0,56,72,221,70,0,175,50,-231,253,
       102,2,253,110,1,221,86,2,221,94,1,26,190,56,64,32,10,19,35,16,246,58
4 DATA -231,183,40,52,221,229,225,253,229,209,6,3,78,26,119,121,18,35,19,16,247,
       42,-221,237,75,-217,183,237,66,250,-194,40,20,34,-221,24,141,71,62,1,24,
       183,229,209,25,25,237,91,-229,25,201,42,-225,35,34,-225,237,75,-223,183
5 DATA 237,66,250,-58,202,-58,195,-28
6 DEFINT S: S4PTRMSB = FIX(S4PTR!/256): S4PTRLSB = S4PTR! - S4PTRMSB*256
7 FOR S4INDEX = 0 TO 216: REM Install SORT4; negative values require relocation
8     READ S4BYTE: IF S4BYTE =>0 THEN POKE S4PTR!+S4INDEX,S4BYTE: GOTO 13
9     S4LSB = S4PTRLSB + ABS(S4BYTE): S4MSB = S4PTRMSB: REM Do relocation
10    IF S4LSB > 255 THEN S4LSB = S4LSB - 256: S4MSB = S4MSB + 1
11    POKE S4PTR!+S4INDEX,S4LSB: POKE S4PTR!+S4INDEX+1,S4MSB
12    S4INDEX = S4INDEX + 1: REM Step index for extra byte POKE'd
13 NEXT S4INDEX: DEF USR 0 = S4PTR!: REM Define SORT4 code entry point
14 DEF FN SORT4$(X%) = USR 0(MKI$(VARPTR(SORT4ARRAY$(X%))-X%*3) + MKI$(X%))
```

End

Program Listing 2. Sort4 demonstration.

```
110 CLS: DIM SORT4ARRAY$(200): RESTORE
120 FOR S4WORK = 0 TO 187: REM Hash total DATA statements to check typing
130     READ S4BYTE: S4HASH = S4HASH + S4BYTE
140 NEXT S4WORK
150 IF S4HASH <>12413 THEN PRINT "Error in DATA statements; please check!": END
160 PRINT "Setting up 200 7-byte alpha strings .....": PRINT
170 FOR S4WORK = 1 TO 200: REM Generate & display 200 random 7-byte strings
180     SORT4ARRAY$(S4WORK) = STRING$(7,RND(26)+96)
190     PRINT SORT4ARRAY$(S4WORK); " ";
200 NEXT S4WORK
210 PRINT@ 0, "Press <ENTER> when ready to commence sort ....."
220 S4WORK$ = INKEY$: IF S4WORK$ <> CHR$(13) THEN 220
230 CLS: PRINT@ (12,28), "Sorting commenced ....."
240 SOUND 0,0: DUMMY$ = FNSORT4$(200): SOUND 0,0: REM Sort SORT4ARRAY$(1)-(200)
250 CLS: PRINT "Sort complete .....": PRINT
260 FOR S4WORK = 1 TO 200: REM Display sorted strings
270     PRINT SORT4ARRAY$(S4WORK); " ";
280 NEXT S4WORK: END
```

End

System Requirements

Model 4
64K RAM
Basic
TRSDOS 6.X.X

above, then type in Listing 2 and merge Sort4 with it (MERGE "SORT4"). Run the merged program. You'll notice a short pause, during which the program sums the data values and checks the total, called a hash total, to make sure it's correct. If not, the program displays an error message.

If the total is correct, the program displays 200 seven-character strings, randomly sequenced, and prompts you to press the enter key to start the sort. In under a second, you'll see the strings redisplayed in sorted alphabetical order.

Routine Matters

Sort4's heart is the machine-language code in data lines 2–5, which is POKEd into the high RAM area you protected from Basic. Although I said earlier that this area started at location 65,304 (FF18 hexadecimal), you don't have to use that address. If, for example, you're already using part of that area for a printer driver, change the 65,304 in line 1 to a lower address. The program automatically handles all relocation.

Remember, however, that SORT4 requires a 232-byte protected memory area, so be sure to change your Basic load command accordingly. If you change line 1 to read S4PTR! = 62000, you should load Basic by typing in BASIC (M=61999).

Incidentally, the data statements' negative values indicate that the program calculates relocation parameters before it POKEs anything.

Line 14 passes a 4-byte parameter string to the SORT4 machine code. The routine uses the disk-related function MKI$ to store the two integer values most efficiently: as a pointer to the array and a value indicating the number of strings you'll sort.

The array pointer's code in line 14 may seem strange, but it serves a purpose. If you specify a subscript beyond the dimensioned limit, Basic will return an error message, thereby protecting your data in memory from the machine code. ■

You can write to Alan D. Smith at P.O. Box 119, Mortdale, N.S.W. 2223, Australia.

Related Articles

Allan, Ralph C. "Proper Arrangements," June 1984, p. 96. Sort multidimensional string arrays under Model III TRSDOS.

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by Robert C. Lake, Mary R. Golden, and Samuel L. Lett

Reasonable Deductions

Uncle Sam is tightening the reins on home computer tax deductions. Three tax experts explain what's allowed and what isn't.

As you prepare your federal income tax return, you should be aware of some important tax code changes affecting personal computer owners. In an attempt to curb taxpayer abuses, Congress severely limited home computer deductions in the Tax Reform Act of 1984. The new law makes it harder to qualify for a deduction and, in some cases, changes the amount you can deduct.

Many home computer costs are still deductible, however. In this article, we'll review the new deduction criteria and explain the kinds of deductions and tax credits you can claim.

Business Costs

In general, you can deduct computer costs relating to a business or trade, including employee business expenses and certain education expenses. However, the new law strictly limits trade or business deductions if you don't use a computer exclusively at a regular business establishment.

To qualify for a home office deduction, you must use a separate area of your home exclusively for business. The home office must be a principal place of business; for example, if you take work home from the office on weekends, your home study doesn't qualify as a home office.

If you earn secondary income through a home business, such as selling Avon or Amway products, and you use a room at home exclusively for this business, you qualify for a home office deduction.

Trade or business activity could include writing programs for money or computer consulting. The big danger here is that the Internal Revenue Service (IRS) might consider this activity a hobby rather than a business (although hobby costs might also be deductible; see the section below on personal use).

To determine whether an activity is a hobby or a profit-seeking venture, the IRS takes into account your intentions, whether you conduct the activity in a businesslike way, your expertise, the time and effort you spend, the activity's profitability, and whether the activity is recreational. The tax code presumes that an activity is for profit, qualifying as a trade or business, if it's profitable in at least two of the five consecutive years ending with the tax year in question.

Under the new law, an employee may deduct home computer costs only if the computer is for his employer's convenience and is required as a condition of employment.

Income Production Costs

In addition to business costs, you can also deduct the cost of producing or collecting income; managing, conserving, or maintaining income property; or determining any tax. Deductible computer expenses, then, could include using a personal computer to monitor rental property maintenance, analyze an investment portfolio, keep tax records, or do tax planning.

Personal Costs

Personal use of a computer usually doesn't qualify for tax benefits. For example, if you use your computer solely for games, recipe storage, and household budgeting, your costs aren't deductible. However, in some cases you can deduct the cost of using a computer for medical reasons, charitable service, or as a revenue-producing hobby.

Deductible medical uses include treating a child's learning disability or computer-aided physical therapy. Certain computer uses by a handicapped person also qualify. Usually, a physician must prescribe these medical computer uses.

1984 Date	Start Time	Stop Time	Hardware/Software Used	Purpose and Comments
9/17	5:00p	7:30p	Tax Planner, Printer	Calculate third quarter estimate
9/18	11:00a	2:30p	1-2-3 Printer, Modem	Portfolio analysis
9/18	4:00p	5:00p	Space Commander, etc.	Entertainment
9/19	7:00p	9:30p	WordStar	Type bulletin for local professional organization
9/20	7:30p	8:00p	WordStar	Update mailing list for bulletin
9/22	10:00a	1:30p	1-2-3	Design template for possible resale

Figure. Sample log of computer use.

If you provide computer services to a charitable organization you can deduct some out-of-pocket costs. For example, a program for maintaining church pledge records is a deductible expense, and so are supplies like disks and printer paper. You can't deduct the cost of your computer, however, since capital expenditures aren't considered out-of-pocket expenses.

You can deduct hobby expenses if your hobby also produces revenue. If you use your computer to conduct genealogical research as a hobby and you derive some income from your research, you may deduct your costs, including the computer's cost, to offset the income you earn.

Allowable Deductions

If your computer use falls into one of the categories described above, you may claim a deduction for cost recovery or depreciation, Section 179 expensing (see below), and other expenses. Also, you can claim a tax credit equal to a portion of your computer's cost.

If you use your computer for several activities, your deductions or credits apply only to qualified uses. For example, a taxpayer who uses a computer 80 percent for business and 20 percent for personal purposes may deduct only 80 percent of his costs.

Cost Recovery or Depreciation

The cost of a personal computer is usually considered a capital expenditure and you can't fully deduct it in the year of purchase. Instead, you must spread your deduction over a number of years, either five or 12, depending on how you use your computer. The five-year method falls under the accelerated cost recovery system (ACRS) and a 12-year write-off is called a straight-line write-off.

Before the 1984 Tax Reform Act, all qualifying computer owners could use the five-year cost recovery schedule. However, under the new law, if you bought your computer after June 18, 1984, you must use it predominantly (that is, more than half the time) for business in order to qualify for the ACRS deduction. If you use your computer less than half the time for business, you must take your deduction over 12 years.

Under ACRS, the maximum deduction in the purchase year is 15 percent of the cost, no matter when during the year you bought the computer. The second year's maximum deduction is 22 percent; in each of the third, fourth, and fifth years the maximum deduction is 21 percent.

Under ACRS, the maximum deduction in the purchase year is 15 percent, no matter when during the year you bought the computer.

The cost you can recover is the original purchase price, including taxes, freight, and so on, adjusted for any Section 179 expensing or investment credit (see below). This amount is the maximum deduction; your actual deduction must also take into account the proportion of qualifying use. For example, if you use your computer 60 percent for business and 40 percent for personal reasons, you may take only 60 percent of the maximum deduction.

Investment-related activities don't count in determining whether you meet the minimum 50 percent business threshold. However, if you use your personal computer more than half the time for business activities, investment use counts when computing ACRS deductions. A taxpayer who uses a computer 75 percent for his business and 10 percent to monitor rental property maintenance may deduct 85 percent of the maximum.

If you bought your computer after June 18, 1984, and don't use it predominantly for business, your maximum annual deduction is $1/12$ of its cost. In the first year, however, you may take only a half-year's deduction, or $1/24$ of the cost. You base depreciation on the original price with no reduction for any investment tax credit. Again, though, this is the maximum possible deduction. Your actual deduction depends on the percentage of qualifying use.

In addition to the ACRS deduction, you can claim an investment tax credit of up to 10 percent of the cost of a personal computer used predominantly for business. You must reduce the cost you recover under ACRS by half the amount of your credit. If you use your computer only 60 percent for business, your credit is limited to 60 percent of the maximum.

Under Section 179 of the tax code, an immediate write-off is also available to computer owners who use their system predominantly for a trade or business. This gives you the option of deducting up to $5,000 of qualifying capital expenditures in the year of purchase, rather than spreading the deduction over a number of years.

Assume you bought a home computer in October 1984 for $6,000 and used it 80 percent of the time for a consulting business. You may choose to deduct $4,800 of the cost ($6,000 times 80 percent) in 1984. You must spread the remaining $1200 deduction over five years.

Two examples will illustrate the tax options available to a personal computer buyer. Taxpayer A bought a computer for $3,500 in October 1984. He uses it 60 percent for business and 10 percent for investment-related activities. The remaining 30 percent is for personal use. He has the following alternatives in 1984:

- Deduct $2,450 ($3,500 times 70 percent) under Section 179.
- Claim a $245 ($3,500 times 10 percent times 70 percent) investment tax credit and deduct $349 ((($3,500 times 70 percent) – ½ of $245) times (15 percent ACRS allowance)) cost recovery.

Taxpayer B bought a personal computer for $1,500 in September 1984. She uses her computer 25 percent for investment-related activities, the rest of the time for games and other personal purposes. She's limited to the following deduction in 1984:

- Straight-line depreciation of $16 ($1,500 divided by 12 years times ½ first-year limit times 25 percent use). She can't claim an investment tax credit or take advantage of Section 179 expensing.

Other Expenses

Tax rulings for other computer expenses, like software and supplies, depend on how you buy and use the products. Bundled software, that is, software sold along with a computer, is treated as part of the computer cost for tax purposes. The rules for hardware, outlined above, also apply to bundled software.

Programs sold separately are treated as a separate asset. You can deduct their costs only if you use the software in a trade or business, for investment-related activities, for preparing or determining taxes, or for those personal uses specifically allowed as deductions (see above).

You must take your deduction on a straight-line basis over five years or the software's expected useful life, whichever is less. Certain programs, such as tax planning software, often have a useful life of only one year; you can deduct their cost in the year you buy them.

You should allocate the cost of multipurpose software based on use; if you use a spreadsheet program one-half the

time for household budgeting and one-half for investments, you may deduct half its cost.

Supplies like disks, printer ribbons, and paper are usually deductible in the year of purchase, but only to the extent you use them in qualifying activities.

You can deduct other expenses, such as computer books and periodicals, as long as they're necessary to your trade, business, or investment activities.

Changes in Usage

If your ratio of business to personal computer use changes in later years, you may have to compensate for a portion of the deductions or credits you claimed in earlier years. This is called recapturing, and it requires that you report amounts previously deducted as income for the current tax year.

Record-Keeping Requirements

In addition to setting new limits on the amounts of deductions available to personal computer owners, the 1984 tax law also mandates certain record-keeping procedures. In tax years after 1984, you must be able to substantiate by contemporaneous records any deductions or credits relating to computer ownership. The records should accurately indicate the business purpose of computer use, work done, and the date and time. A log like that shown in the Figure should fulfill these requirements.

The law also requires tax preparers to certify that taxpayers claiming personal computer deductions have indicated the existence of adequate documentation.

Failure to comply with the records requirement could lead to penalties for negligence, or even fraud.

Preparing Returns

You should list information about your computer and calculate cost recovery or a depreciation deduction on IRS Form 4562. You can then claim a deduction for cost recovery, depreciation, and Section 179 expensing in one of three places on your tax return.

Use Schedule C (Self-Employment Income) for trade or business claims and Schedule E (Other Income) for deductions relating to rental or royalty income. Claim other deductions on Schedule A (Itemized Deductions). Itemized deductions could include medical use, charitable contributions, investment activities other than those related to real estate or royalty income, and costs incurred in determining taxes. You may take Schedule C and Schedule E deductions whether you itemize or not; Schedule A deductions apply only if you itemize.

Summary

To gain the maximum possible tax benefit from computer ownership, you must monitor and document computer use and maintain qualified use. If you do so, your tax savings can be significant, despite the tax code's new restrictions. ■

The authors teach accounting at Auburn University at Montgomery; all are certified public accountants and experienced tax advisors. You can contact them at Auburn University at Montgomery, Montgomery, AL 36193.

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Athanasiou, Robert. "The Taxman Cometh," January 1984, p. 100. A Model I/III program that records income and deductions.

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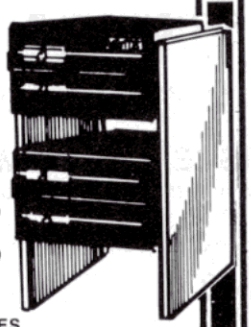

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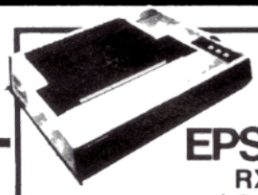

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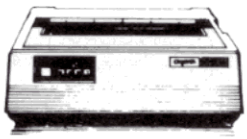

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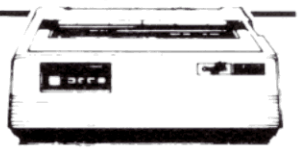

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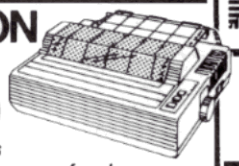

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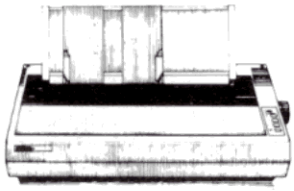

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Listing 1 continued from p. 57

```
12750          DEFM    'FFFFFFFFFFFFFFFF'
12760          DEFM    'FFF::O::::::::'
12770          DEFM    ':::GFFFFFFFFFFF'
12780          DEFM    'FFFFFFFFFFFFFFFF'
12790          DEFM    'FFFFFFFFFFFFFFFF'
12800          DEFM    'FFFFF?::::::::::'
12810          DEFM    '::::::::::::::::'
12820          DEFM    '::::::::::::::::'
12830          DEFM    '::::::::::::::::'
12840          DEFM    '::::::::::::::::'
12850          DEFM    '::::::::::::::::'
12860          DEFM    '::::::::::::::::'
12870          DEFM    '::::::::::::::::'
12880          DEFM    '::::::::::::::::'
12890          DEFM    '::::::::::::::::'
12900          DEFM    '::::::::::::::::'
12910          DEFM    '::::::::::::::::'
12920          DEFM    '::::::::::::::::'
12930 AUTH     DEFM    ' Press <ENTER> To
start program'
12940 LPRINT   CALL    SAVE
12950          LD      A,(LPRORE)
12960          CP      'R'
12970          JP      Z,LP0
12980          CP      'E'
12990          JP      Z,LP0
13000          CALL    CLS
13010          LD      HL,ALPR
13020          LD      DE,15880
13030          LD      BC,(ALPR1)
13040          LDIR
13050 LP0A     CALL    2BH
13060          OR      A
13070          JP      Z,LP0A
13080          CP      'R'
13090          JP      Z,LP0B
13100          CP      'E'
13110          JP      Z,LP0B
13120          LD      A,(14400)
13130          CP      4
13140          JP      Z,BREAK
13150          JP      LP0A
13160 LP0B     LD      (LPRORE),A
13170          CALL    LOAD
13180 LP0      CALL    002BH
13190          OR      A
13200          JP      Z,LP0
13210          CP      'S'
13220          JP      Z,LP1
13230          CP      'M'
13240          JP      Z,LP2
13250          CP      'L'
13260          JP      Z,LP3
13270          CP      'D'
13280          JP      Z,LP4
13290          CP      'E'
13300          JP      Z,LP0B
13310          CP      'R'
13320          JP      Z,LP0B
13330          LD      A,(14400)
13340          CP      4
13350          JP      Z,BREAK
13360          JP      LP0
13370 LP1      LD      A,1
13380          LD      (LPA),A
13390          LD      A,2
13400          LD      (LPB),A
13410 LP1A     CALL    2BH
13420          OR      A
13430          JP      Z,LP1A
13440          CP      '1'
13450          JP      Z,LP1B
13460          CP      '2'
13470          JP      Z,LP1B
13480          CP      '3'
13490          JP      Z,LP1B
13500          LD      A,(14400)
13510          CP      4
13520          JP      Z,BREAK
13530          JP      LP1A
13540 LP1B     SUB     30H
13550          LD      (TEMA),A
13560          LD      A,(LPA)
13570          LD      B,A
13580          LD      HL,0
13590          LD      DE,158
13600          CALL    LP1D
13610          JP      LP5
13620 LP1C     LD      A,(LPA)
13630          LD      B,A
13640          LD      HL,30
13650          LD      DE,128
13660          CALL    LP1D
13670          RET
13680 LP1D     ADD     HL,DE
13690          DJNZ    LP1D
13700          LD      (LPMOD),HL
13710          RET
13720 LP2      LD      A,2
13730          LD      (LPA),A
13740          LD      A,4
13750          LD      (LPB),A
13760          CALL    LP1C
13770 LP2A     LD      A,1
13780          LD      (TEMA),A
13790          JP      LP5
13800 LP3      LD      A,3
13810          LD      (LPA),A
13820          LD      A,6
13830          LD      (LPB),A
13840          CALL    LP1C
13850          JP      LP2A
13860 LP4      LD      A,1
13870          LD      (TEMA),A
13880 LP4A     LD      A,(14400)
13890          CP      4
13900          JP      Z,BREAK
13910          LD      A,(3810H)
13920          OR      A
13930          JP      Z,LP4A
13940          AND     30
13950          JP      Z,LP4A
13960          CALL    LP4C
13970          CALL    LP4G
13980          LD      (LPA),A
13990 LP4B     LD      A,(14400)
14000          CP      4
14010          JP      Z,BREAK
14020          LD      A,(3810H)
14030          OR      A
14040          JP      Z,LP4B
14050          AND     254
14060          JP      Z,LP4B
14070          CALL    LP4C
14080          CALL    LP4G
14090          LD      (LPB),A
14100          CALL    LP1C
14110          JP      LP5
14120 LP4C     PUSH    AF
14130 LP4D     LD      A,(3810H)
14140          OR      A
14150          JP      NZ,LP4D
14160          JP      POPART
14170 LP4G     LD      B,-1
14180 LP4H     INC     B
14190          SRL     A
14200          JP      NC,LP4H
14210          LD      A,B
14220          RET
14230 LP5      LD      A,(LPA)
14240          LD      (LPC),A
14250          LD      A,(LPB)
14260          LD      (LPD),A
14270          CALL    CLPBF
14280          XOR     A
14290          LD      (XXX),A
14300          LD      (YYY),A
14310          LD      A,(LPRORE)
14320          CP      'R'
14330          JP      Z,LPR5
14340          LD      A,128
14350          LD      (LPBIT),A
14360          LD      A,27
14370          CALL    LPCHAR
14380          LD      A,'@'
14390          CALL    LPCHAR
14400          LD      A,27
14410          CALL    LPCHAR
14420          LD      A,'A'
14430          CALL    LPCHAR
14440          LD      A,8
14450          CALL    LPCHAR
14460          JP      LP6
14470 LPR5     LD      A,18
14480          CALL    LPCHAR
14490          LD      A,1
14500          LD      (LPBIT),A
14510          JP      LP6
14520 LP6      LD      A,(14400)
14530          CP      4
14540          JP      Z,LPQUIT
14550          LD      A,(YYY)
14560          LD      D,A
14570          LD      A,(XXX)
14580          LD      E,A
14590          PUSH    HL
14600          CALL    TEST
14610          POP     HL
14620          JP      Z,LP7
14630          LD      A,(LPBIT)
14640          OR      (HL)
14650          LD      (HL),A
14660 LP7      INC     HL
14670          LD      A,(XXX)
14680          CP      127
14690          JP      Z,LP8
14700          INC     A
14710          LD      (XXX),A
14720          JP      LP6
14730 LP8      XOR     A
14740          LD      (XXX),A
14750          LD      A,(LPRORE)
14760          CP      'R'
14770          JP      Z,LPR8
14780          LD      A,(LPBIT)
14790          SRL     A
14800          LD      (LPBIT),A
14810          OR      A
14820          JP      LP8A
14830 LPR8     LD      A,(LPBIT)
14840          SLA     A
14850          LD      (LPBIT),A
14860          CP      128
14870 LP8A     CALL    Z,LPLP
14880          LD      HL,LPBUF
14890          LD      A,(LPD)
14900          DEC     A
14910          LD      (LPD),A
14920          JP      NZ,LP6
14930          LD      A,(LPB)
14940          LD      (LPD),A
14950          LD      A,(YYY)
14960          CP      47
14970          JP      Z,LPEND
14980          INC     A
14990          LD      (YYY),A
15000          JP      LP6
15010 LPEND    LD      A,(TEMA1)
15020          DEC     A
15030          CALL    NZ,LPLP
15040          LD      B,3
15050 LPEND1   LD      A,13
15060          CALL    LPCHAR
15070          DJNZ    LPEND1
15080          LD      A,(LPRORE)
15090          CP      'E'
15100          JP      Z,LPEND2
15110          LD      A,30
15120          CALL    LPCHAR
15130 LPEND3   JP      CLRRET
15140 LPEND2   LD      A,27
15150          CALL    LPCHAR
15160          LD      A,'@'
15170          CALL    LPCHAR
15180          JP      LPEND3
15190 LPBI     LD      A,(LPRORE)
15200          CP      'R'
15210          JP      Z,LPBR
15220          LD      A,128
15230          LD      (LPBIT),A
15240          RET
15250 LPBR     LD      A,1
15260          LD      (LPBIT),A
15270          RET
15280 LPLP     CALL    LPBI
15290          LD      A,(TEMA)
15300          LD      B,A
15310 LP9      PUSH    BC
15320          LD      HL,LPBUF
15330          LD      B,128
15340          LD      A,(LPRORE)
15350          CP      'R'
15360          JP      Z,LP10
15370          LD      A,27
15380          CALL    LPCHAR
15390          LD      A,75
15400          CALL    LPCHAR
15410          LD      A,(LPMOD)
15420          CALL    LPCHAR
15430          LD      A,(LPDIV)
15440          CALL    LPCHAR
15450 LP10     LD      A,(14400)
15460          CP      4
15470          JP      Z,LPBRK
15480          LD      A,(HL)
15490          CALL    LPCHAR
15500          LD      A,(LPC)
15510          DEC     A
15520          LD      (LPC),A
15530          JP      NZ,LP10
15540          INC     HL
15550          LD      A,(LPA)
15560          LD      (LPC),A
15570          DJNZ    LP10
15580          LD      A,(LPRORE)
15590          CP      'R'
```

Listing 1 continued

```
15600          JP      Z,LPTAB
15610          LD      B,30
15620 LPTAB1   XOR     A
15630          CALL    LPCHAR
15640          DJNZ    LPTAB1
15650          JP      LP10A
15660 LPTAB    LD      B,30
15670 LPTAB2   LD      A,128
15680          CALL    LPCHAR
15690          DJNZ    LPTAB2
15700 LP10A    POP     BC
15710          DJNZ    LP9
15720          CALL    CLPBF
15730          LD      A,13
15740          CALL    LPCHAR
15750          LD      A,(YYY)
15760          CP      47
15770          JP      Z,LP11
15780          XOR     A
15790          LD      (TEMA1),A
15800          RET
15810 LP11     LD      A,1
15820          LD      (TEMA1),A
15830          RET
15840 LPCHAR   PUSH    AF
15850 LPC1     LD      A,(14400)
15860          CP      4
15870          JP      Z,POPART
15880          IN      A,(0F8H)
15890          AND     0F0H
15900          CP      30H
15910          JP      NZ,LPC1
15920          POP     AF
15930          OUT     (0F8H),A
15940          RET
15950 LPBRK    POP     HL
15960          POP     HL
15970 LPQUIT   LD      A,13
15980          CALL    LPCHAR
15990          LD      A,30
16000          CALL    LPCHAR
16010          JP      BREAK
16020 CLPBF    LD      HL,LPBUF
16030          LD      DE,LPBUF+1
16040          LD      BC,127
16050          LD      A,(LPRORE)
16060          CP      'R'
16070          JP      Z,CLPBF1
16080          XOR     A
16090          JP      CLPBF2
16100 CLPBF1   LD      A,128
16110 CLPBF2   LD      (HL),A
16120          LDIR
16130          LD      HL,LPBUF
16140          RET
16150 ALPR     DEFM    'type (R)
for Radio Shack or (E) for epson'
16160 ALPR1    DEFW    $-ALPR
16170 CHANGE   LD      (HL),80H
16180          RET
17030 POPART   POP     AF
17040          RET
17050 POPHRT   POP     HL
17060          RET
17070 CLRRET   XOR     A
17080          RET
17090 POPHDB   POP     HL
17100          POP     DE
17110          POP     BC
17120          RET
17130 XXX      DEFB    00
17140 YYY      DEFB    00
17150 LPRORE   DEFB    0
17160 LPA      DEFB    0
17170 LPB      DEFB    0
17180 LPC      DEFB    0
17190 LPD      DEFB    0
17200 LPMOD    DEFB    0
17210 LPDIV    DEFB    0
17220 LPBUF    DEFS    128
17230 LPBIT    DEFB    0
17240 ADVAN    CALL    SAVE
17250          CALL    BREAK
17260 ADVAN1   LD      HL,3C00H
17270          LD      BC,1024
17280 CNTY     LD      A,(14400)
17290          CP      4
17300          JP      Z,BREAK
17310          LD      A,(HL)
17320          CP      20H
17330          JP      Z,NXTT
17340          INC     (HL)
17350 NXTT     INC     HL
17360          DEC     BC
17370          LD      A,B
17380          OR      C
17390          JP      Z,CNTT
17400          JP      CNTY
17410 CNTT     LD      HL,3C00H
17420          LD      BC,1024
17430 NEXTT    LD      A,(HL)
17440          CP      20H
17450          JP      NZ,WAITT
17460          INC     HL
17470          DEC     BC
17480          LD      A,B
17490          OR      C
17500          JP      Z,402DH
17510          JP      NEXTT
17520 WAITT    LD      B,0
17530 LOOPT    DJNZ    LOOPT
17540          JP      ADVAN1
17550 BREAK    LD      A,(14400)
17560          BIT     2,A
17570          JP      NZ,BREAK
17580          CALL    LOAD
17590          LD      A,3
17600          LD      (BB),A
17610          JP      CLRRET
17620 NEWKEY   LD      A,2
17630          LD      (BB),A
17640          LD      A,(XX)
17650          LD      (XXX),A
17660          LD      A,(YY)
17670          LD      (YYY),A
17680 NEWAAA   CALL    002BH
17690          OR      A
17700          JP      Z,NEWAAA
17710          CALL    SAVE
17720          CP      'W'
17730          JP      Z,NEWWHI
17740          CP      'B'
17750          JP      Z,NEWCLS
17760          CP      'N'
17770          JP      Z,NEWNEG
17780          CP      'P'
17790          JP      Z,NEWOVR
17800          CP      31H
17810          JP      Z,NEWXXX
17820          CP      32H
17830          JP      Z,NEWXXX
17840          CP      33H
17850          JP      Z,NEWXXX
17860          CP      34H
17870          JP      Z,NEWXXX
17880          CP      35H
17890          JP      Z,NEWXXX
17900          LD      A,(14400)
17910          CP      4
17920          JP      Z,BREAK
17930          JP      NEWAAA
17940 NEWXXX   LD      (TEMA1),A
17950          JP      PARAM
17960 ENDPAR   LD      A,0FFH
17970          LD      (IX),A
17980          INC     IX
17990          LD      (IX),A
18000          LD      A,(TEMA1)
18010          CP      31H
18020          JP      Z,SPEC1
18030          CP      32H
18040          JP      Z,SPEC2
18050          CP      33H
18060          JP      Z,SPEC3
18070          CP      34H
18080          JP      Z,SPEC4
18090          JP      SPEC5
18100 PARAM    CALL    SAVE
18110          CALL    KEEP
18120          XOR     A
18130          LD      HL,NEWBUF
18140          LD      (WORD1),HL
18150 NEWPAR   CALL    PFLASH
18160          LD      BC,1400
18170 NEULOO   CALL    WASTE
18180          CALL    PFLASH
18190          LD      A,(14400)
18200          AND     125
18210          JP      Z,NEWPAR
18220          CP      4
18230          JP      Z,PAREND
18240          CALL    ROUTNS
18250          CP      1
18260          JP      Z,PARAM3
18270          LD      HL,(WORD1)
18280          LD      A,(YY)
18290          LD      (HL),A
18300          INC     HL
18310          LD      A,(XX)
18320          LD      (HL),A
18330          INC     HL
18340          LD      (WORD1),HL
18350          JP      NEWPAR
18360 PARAM3   CALL    LOAD
18370          LD      HL,(WORD1)
18380          LD      DE,NEWBUF
18390          OR      A
18400          SBC     HL,DE
18410          RET     Z
18420          PUSH    HL
18430          POP     BC
18440 FIXCOU   DEC     HL
18450          DEC     BC
18460          DEC     BC
18470          LD      A,B
18480          OR      C
18490          JP      NZ,FIXCOU
18500          LD      (NEWCOU),HL
18510 PARAM1   LD      IX,BUFLAS
18520 PARAM2   LD      HL,NEWBUF
18530          LD      DE,(NEWCOU)
18540 CONPAR   LD      A,(HL)
18550          CP      0FFH
18560          JP      NZ,NEXPAR
18570          INC     HL
18580          INC     HL
18590          DEC     DE
18600          LD      A,D
18610          OR      E
18620          JP      NZ,CONPAR
18630          JP      ENDPAR
18640 NEXPAR   CALL    SMALLY
18650          CALL    SMALLX
18660          CALL    LARGEX
18670          LD      L,0
18680          LD      A,(PARSX)
18690          LD      (IX),A
18700          INC     IX
18710 MORPAR   LD      A,(PARY)
18720          LD      D,A
18730          LD      A,(PARSX)
18740          LD      E,A
18750          PUSH    HL
18760          CALL    TEST
18770          POP     HL
18780          JP      Z,PARRES
18790          SCF
18800 PARPUS   RR      H
18810          JP      PARA
18820 PARRES   OR      A
18830          JP      PARPUS
18840 PARA     LD      A,(PARSX)
18850          INC     A
18860          LD      (PARSX),A
18870          LD      D,A
18880          LD      A,(PARLX)
18890          INC     A
18900          CP      D
18910          JP      Z,PARNX
18920          INC     L
18930          LD      A,L
18940          CP      6
18950          JP      NZ,MORPAR
18960          OR      A
18970          RR      H
18980          SCF
18990          RR      H
19000          LD      A,H
19010          LD      (IX),A
19020          INC     IX
19030          LD      L,0
19040          JP      MORPAR
19050 PARNX    INC     L
19060          LD      A,L
19070          CP      7
19080          JP      Z,PARMOX
19090          OR      A
19100          RR      H
19110          JP      PARNX
19120 PARMOX   SCF
19130          RR      H
19140          LD      A,H
19150          LD      (IX),A
19160          INC     IX
19170          LD      A,(PARLX)
19180          LD      (IX),A
19190          INC     IX
19200          CALL    PARFIL
19210          JP      PARAM2
19220 PARFIL   LD      HL,NEWBUF
19230          LD      DE,(NEWCOU)
19240          LD      A,(PARY)
19250          LD      B,A
19260 MORFIL   LD      A,(HL)
19270          CP      B
19280          JP      Z,KILPAR
```

```
19290 NEXFIL  INC    HL
19300         INC    HL
19310         DEC    DE
19320         LD     A,D
19330         OR     E
19340         RET    Z
19350         JP     MORFIL
19360 KILPAR  LD     A,0FFH
19370         LD     (HL),A
19380         JP     NEXFIL
19390 PAREND  CALL   LOAD
19400         JP     BREAK
19410 PFLASH  LD     DE,NEWBUF
19420         LD     HL,(WORD1)
19430         OR     A
19440         SBC    HL,DE
19450         LD     A,H
19460         OR     L
19470         RET    Z
19480         PUSH   HL
19490         POP    BC
19500         LD     HL,NEWBUF
19510 PFMORE  LD     A,(HL)
19520         LD     D,A
19530         INC    HL
19540         LD     A,(HL)
19550         LD     E,A
19560         PUSH   BC
19570         PUSH   HL
19580         CALL   TEST
19590         POP    HL
19600         PUSH   HL
19610         JP     Z,PFOFF
19620 PFONN   DEC    HL
19630         LD     A,(HL)
19640         LD     D,A
19650         INC    HL
19660         LD     A,(HL)
19670         LD     E,A
19680         CALL   RESET
19690         JP     PFCONT
19700 PFOFF   DEC    HL
19710         LD     A,(HL)
19720         LD     D,A
19730         INC    HL
19740         LD     A,(HL)
19750         LD     E,A
19760         CALL   SET
19770 PFCONT  POP    HL
19780         POP    BC
19790         INC    HL
19800         DEC    BC
19810         LD     A,B
19820         OR     C
19830         RET    Z
19840         DEC    BC
19850         LD     A,B
19860         OR     C
19870         RET    Z
19880         JP     PFMORE
19890 SMALLY  PUSH   BC
19900         PUSH   DE
19910         PUSH   HL
19920         LD     D,0FFH
19930         LD     HL,NEWBUF
19940         LD     BC,(NEWCOU)
19950 PARY0   LD     A,(HL)
19960         CP     D
19970         JP     C,PARY1
19980 PARY2   INC    HL
19990         INC    HL
20000         DEC    BC
20010         LD     A,B
20020         OR     C
20030         JP     NZ,PARY0
20040         LD     A,D
20050         LD     (PARY),A
20060         JP     POPHDB
20070 PARY1   LD     D,A
20080         JP     PARY2
20090 SMALLX  PUSH   BC
20100         PUSH   DE
20110         PUSH   HL
20120         LD     A,(PARY)
20130         LD     D,A
20140         LD     E,0FFH
20150         LD     HL,NEWBUF
20160         LD     BC,(NEWCOU)
20170 PARSX0  LD     A,(HL)
20180         CP     D
20190         JP     Z,PARSX1
20200 PARSX2  INC    HL
20210         INC    HL
20220 PARSX4  DEC    BC
20230         LD     A,B
20240         OR     C
20250         JP     NZ,PARSX0
20260         LD     A,E
20270         LD     (PARSX),A
20280         JP     POPHDB
20290 PARSX1  INC    HL
20300         LD     A,(HL)
20310         CP     E
20320         JP     C,PARSX3
20330 PARSX5  INC    HL
20340         JP     PARSX4
20350 PARSX3  LD     E,A
20360         JP     PARSX5
20370 LARGEX  PUSH   BC
20380         PUSH   DE
20390         PUSH   HL
20400         LD     A,(PARY)
20410         LD     D,A
20420         LD     E,0
20430         LD     HL,NEWBUF
20440         LD     BC,(NEWCOU)
20450 PARLX0  LD     A,(HL)
20460         CP     D
20470         JP     Z,PARLX1
20480 PARLX2  INC    HL
20490         INC    HL
20500 PARLX4  DEC    BC
20510         LD     A,B
20520         OR     C
20530         JP     NZ,PARLX0
20540         LD     A,E
20550         LD     (PARLX),A
20560         JP     POPHDB
20570 PARLX1  INC    HL
20580         LD     A,(HL)
20590         CP     E
20600         JP     NC,PARLX3
20610 PARLX5  INC    HL
20620         JP     PARLX4
20630 PARLX3  LD     E,A
20640         JP     PARLX5
20650 PSPEC0  LD     A,(14400)
20660         CP     4
20670         JP     Z,BREAK
20680         LD     A,(3810H)
20690         AND    62
20700         JP     Z,PSPEC0
20710         PUSH   AF
20720 PS1     LD     A,(3810H)
20730         OR     A
20740         JP     NZ,PS1
20750         POP    AF
20760         CP     2
20770         JP     Z,PSPEC1
20780         CP     4
20790         JP     Z,PSPEC2
20800         CP     8
20810         JP     Z,PSPEC3
20820         CP     16
20830         JP     Z,PSPEC4
20840         CP     32
20850         JP     Z,PSPEC5
20860         JP     PSPEC0
20870 PSPEC1  LD     HL,KEY1
20880         JP     PSPEC
20890 PSPEC2  LD     HL,KEY2
20900         JP     PSPEC
20910 PSPEC3  LD     HL,KEY3
20920         JP     PSPEC
20930 PSPEC4  LD     HL,KEY4
20940         JP     PSPEC
20950 PSPEC5  LD     HL,KEY5
20960         JP     PSPEC
20970 PSPEC   LD     A,(HL)
20980         LD     (TEMA),A
20990         LD     A,(XX)
21000         LD     (TEMA1),A
21010         INC    HL
21020 PSLOOP  LD     A,(HL)
21030         CP     128
21040         JP     C,PSNEX
21050         LD     B,6
21060 PSDJNZ  RR     A
21070         PUSH   AF
21080         LD     A,(BB)
21090         DEC    A
21100         JP     Z,PSPOPS
21110         DEC    A
21120         JP     Z,PSPOPR
21130         DEC    A
21140         JP     Z,PSNGB
21150         DEC    A
21160         JP     Z,PSOVW
21170         DEC    A
21180         JP     Z,PSOVB
21190         JP     PSNGW
21200 PSPOPS  POP    AF
21210         JP     PSSET
21220 PSPOPR  POP    AF
21230         JP     PSRES
21240 PSOVB   POP    AF
21250         JP     C,PSRES
21260         PUSH   AF
21270         PUSH   BC
21280         PUSH   HL
21290         JP     PSNEXT
21300 PSOVW   POP    AF
21310         JP     C,PSSET
21320         PUSH   AF
21330         PUSH   BC
21340         PUSH   HL
21350         JP     PSNEXT
21360 PSNGB   POP    AF
21370         JP     NC,PSRES
21380         PUSH   AF
21390         PUSH   BC
21400         PUSH   HL
21410         JP     PSNEXT
21420 PSNGW   POP    AF
21430         JP     NC,PSSET
21440         PUSH   AF
21450         PUSH   BC
21460         PUSH   HL
21470         JP     PSNEXT
21480 PSRES   PUSH   AF
21490         PUSH   BC
21500         PUSH   HL
21510         LD     A,(YY)
21520         LD     D,A
21530         LD     A,(XX)
21540         LD     E,A
21550         CALL   RESET
21560         JP     PSNEXT
21570 PSSET   PUSH   AF
21580         PUSH   BC
21590         PUSH   HL
21600         LD     A,(YY)
21610         LD     D,A
21620         LD     A,(XX)
21630         LD     E,A
21640         CALL   SET
21650 PSNEXT  LD     A,(XX)
21660         INC    A
21670         CP     128
21680         CALL   Z,PSLFIX
21690 PSOK    LD     (XX),A
21700         POP    HL
21710         POP    BC
21720         POP    AF
21730         DJNZ   PSDJNZ
21740         INC    HL
21750         JP     PSLOOP
21760 PSNEX   INC    HL
21770         LD     A,(HL)
21780         CP     0FFH
21790         JP     Z,PSFINI
21800         LD     C,0
21810         LD     A,(TEMA)
21820         LD     B,A
21830         LD     A,(TEMA1)
21840         LD     D,A
21850         LD     A,(HL)
21860         CP     B
21870         JP     Z,PSOK2
21880         JP     NC,PSGREA
21890 PSLESS  INC    A
21900         INC    C
21910         CP     128
21920         CALL   Z,PSLFIX
21930 PSLES1  CP     B
21940         JP     NZ,PSLESS
21950         LD     B,C
21960         LD     A,D
21970         JP     PSMIN
21980 PSLFIX  JP     CLRRET
21990         RET
22000 PSADD   INC    A
22010         CP     128
22020         CALL   Z,PSLFIX
```

Listing 1 continued

```
22030          DJNZ    PSADD
22040 PSOK1    LD      (XX),A
22050          LD      A,(YY)
22060          INC     A
22070          CP      48
22080          CALL    Z,PSLFIX
22090          LD      (YY),A
22100          JP      PSPEC
22110 PSOK2    LD      A,D
22120          JP      PSOK1
22130 PSGREA   DEC     A
22140          INC     C
22150          CP      255
22160          CALL    Z,PSGFIX
22170 PSGRE1   CP      B
22180          JP      NZ,PSGREA
22190          LD      B,C
22200          LD      A,D
22210          JP      PSADD
22220 PSGFIX   LD      A,127
22230          RET
22240 PSMIN    DEC     A
22250          CP      255
22260          CALL    Z,PSGFIX
22270          DJNZ    PSMIN
22280          JP      PSOK1
22290 PSFINI   LD      A,3
22300          LD      (BB),A
22310          LD      A,(XXX)
22320          LD      (XX),A
22330          LD      A,(YYY)
22340          LD      (YY),A
22350          RET
22360 TEMA     DEFB    0
22370 TEMA1    DEFB    0
22380 KEY1     DEFS    1153
22390 KEY2     DEFS    1153
22400 KEY3     DEFS    1153
22410 KEY4     DEFS    1153
22420 KEY5     DEFS    1153
22430 BUFLAS   DEFS    1153
22440 NEWBUF   DEFS    1800H
22450 NEWCOU   DEFW    0000
22460 PARY     DEFB    0
22470 PARSX    DEFB    0
22480 PARLX    DEFB    0
22490 SPEC1    LD      DE,KEY1
22500          JP      SPEC
22510 SPEC2    LD      DE,KEY2
22520          JP      SPEC
22530 SPEC3    LD      DE,KEY3
22540          JP      SPEC
22550 SPEC4    LD      DE,KEY4
22560          JP      SPEC
22570 SPEC5    LD      DE,KEY5
22580          JP      SPEC
22590 SPEC     LD      HL,BUFLAS
22600          LD      BC,1153
22610          LDIR
22620          RET
22630 NEWWHI   LD      A,1
22640 NEWFUN   LD      (BB),A
22650          JP      PSPEC0
22660 NEWCLS   LD      A,2
22670          JP      NEWFUN
22680 NEWNEG   CALL    002BH
22690          CP      'B'
22700          JP      Z,NWNEG1
22710          CP      'W'
22720          JP      Z,NWNEG2
22730          LD      A,(14400)
22740          CP      4
22750          JP      Z,BREAK
22760          JP      NEWNEG
22770 NWNEG1   LD      A,5
22780          JP      NEWFUN
22790 NWNEG2   LD      A,6
22800          JP      NEWFUN
22810 NEWOVR   CALL    002BH
22820          CP      'B'
22830          JP      Z,NWOVR1
22840          CP      'W'
22850          JP      Z,NWOVR2
22860          LD      A,(14400)
22870          CP      4
22880          JP      Z,BREAK
22890          JP      NEWOVR
22900 NWOVR1   LD      A,3
22910          JP      NEWFUN
22920 NWOVR2   LD      A,4
22930          JP      NEWFUN
22940          END     START
```

End

Program Listing 2. UTIL1/BAS.

```
10 DEFUSR0=&HF000:CMD"B","OFF"
20 CLEAR 255
25 CLS
30 PRINT @520,;
40 INPUT "WHAT SHOULD THE DIAMETER OF THE CIRCLE BE";Z
50 IF Z<>INT(Z) OR Z>47 THEN PRINT "INTERGER BETWEEN 1 AND 47 PLEA
SE":FOR X=1 TO 1000:NEXT:GOTO 25
55 CLS:PRINT @128,
60 PRINT "Position cursor where you want circle to be and press (<
d>raw)"
70 PRINT "After Circle is drawn to your satisfaction type (<F>inis
h)"
80 PRINT "Press <Space Bar> to start program"
90 PRINT "Press <Clear> to redefine circle size"
100 PRINT "Press <L> to reload original picture"
110 PRINT "Press <S> to save or <break> to quit and save"
111 PRINT "Press <C> to clear screen"
112 PRINT "Press <W> to White out screen"
120 A=PEEK(14400):IF A<>2 AND A<>128 THEN 120  ELSE GOSUB 470
121 IF A=2 THEN 20
130 X=0:Y=0
140 A$=INKEY$
150 A=PEEK(14400)
160 IF A=4 THEN GOSUB 490  :CMD"I","GRAPH TEMP/GRA"
170 IF A=8 THEN Y=Y-1
180 IF A$="L" THEN GOSUB 470
190 IF A=16 THEN Y=Y+1
200 IF A=2 THEN GOSUB 490  :GOTO 25
210 IF A=32 THEN X=X-1
220 IF A=64 THEN X=X+1
230 IF A=40 THEN Y=Y-1:X=X-1
240 IF A=80 THEN Y=Y+1:X=X+1
250 IF A=72 THEN Y=Y-1:X=X+1
260 IF A=48 THEN Y=Y+1:X=X-1
270 IF A$="C" THEN FOR D=15360 TO 16383:POKE D,128:NEXT
275 IF A$="W" THEN FOR D=15360 TO 16383:POKE D,191:NEXT
280 IF A$="S" THEN GOSUB 490
290 IF Y<0 THEN Y=47
300 IF Y>47 THEN Y=0
310 IF X<0 THEN X=127
320 IF X>127 THEN X=0
330 IF POINT (X,Y) THEN RESET (X,Y) ELSE SET(X,Y)
340 IF POINT (X,Y) THEN RESET (X,Y) ELSE SET(X,Y)
350 IF A$="D" THEN GOSUB 370
360 GOTO 140
370 B=1
380 T=0
390 A=T/3.14159
400 SX=X+Z*SIN(A)
410 SY=Y+(Z/2)*COS(A)
420 T=T+1
425 A$=INKEY$:IF A$="" THEN 430
426 IF A$="F" THEN RETURN
430 IF SX<0 OR SX>127 OR SY<0 OR SY>47 THEN 460
440 SET (SX,SY)
460 GOTO 390
470 CMD"L","LOAD/UTL"
480 A=USR(0):RETURN
490 CMD"L","SAVE/UTL"
500 GOTO 480
```

End

Program Listing 3. UTIL2/BAS.

```
10 CMD"B","OFF":CLS
15 PRINT "Press <P> for printer or <S> for screen"
16 A$=INKEY$:IF A$<>"P" AND A$<>"S" THEN 16
17 IF A$="S" THEN 20
18 READ A$:IF A$="EOF" THEN RESTORE:GOTO 30
19 LPRINT A$:GOTO 18
20 FOR A=1 TO 15:READ A$:IF A$="EOF" THEN A=15:RESTORE:GOTO 26
25 PRINT A$
26 NEXT
30 PRINT "Press <ENTER> to continue   or <BREAK> to end";
40 IF PEEK(14400)=1 THEN CLS:GOTO 20
50 IF PEEK(14400)=4 THEN CMD"I","GRAPH TEMP
60 GOTO 40
70 DATA "T H I S  I S  A  Q U I C K  R E F E R E N C E  P R O G R
A M ."
80 DATA "          T O  L E A R N  H O W  T O  U S E  G R A P H"
90 DATA "                C O N S U L T  T H E  M A N U A L"
100 DATA " ","LISTING OF KEYS AND THEIR FUNCTIONS"
110 DATA " "
112 DATA "1 -- INCREASE CURSOR SPEED. (MAY BE PRESSED MANY TIMES)"
```

Listing 3 continued

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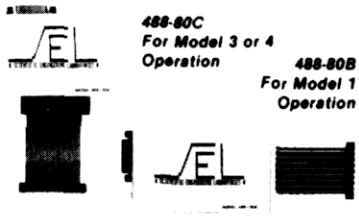

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Listing 3 continued

```
114 DATA "2 -- DECREASE CURSOR SPEED. (MAY BE PRESSED MANY TIMES)"
120 DATA "B -- TURNS THE PICTURE BACKWARDS.  (MIRROR IMAGE)"
130 DATA "C -- CLEARS THE SCREEN. (BLACK)"
140 DATA "DC -- SHOWS A CATALOG OF DISK FILES AND DISPLAYS THEM."
150 DATA "DL + NAME -- LOAD A PICTURE FROM DISK BY THE NAME 'NAME/
GRA'"
151 DATA "DO -- REDISPLAYS PREVIOUS CATALOG."
160 DATA "DS + NAME -- SAVES A PICTURE ON DISK BY THE NAME 'NAME/G
RA'"
170 DATA "E -- EXCHANGES PICTURE ON SCREEN WITH ONE STORED USING '
S'."
175 DATA "H -- CREATE A BACKROUND OF HORIZONTAL LINES."
180 DATA "I -- INITIALIZES THE USER-DEFINABLE KEYS. (SEE MANUAL)"
190 DATA "K -- TOGGLE BETWEEN NON-DRAWING MODE AND NEGATING MODE."
200 DATA "LT -- LOAD PICTURE FROM SHORT MEMORY."
201 DATA "LP -- LOAD PICTURE FROM PERMANANT MEMORY."
210 DATA "M -- TOGGLE BETWEEN DRAWING COLOR. (BLACK OR WHITE)"
220 DATA "N -- NEGATE IMAGE.  REVERSE EVERY PIXEL."
230 DATA "P -- HARDCOPY ON PRINTER.  SEE MANUAL FOR PRINTER TYPES.
"
240 DATA "Q -- PLAID BACKROUND.  EVERY OTHER PIXEL IS ON OR OFF."
250 DATA "R -- CREATE A PSEUDO-RANDOM BACKROUND."
260 DATA "S -- SAVE PICTURE IN PERMANANT MEMORY."
270 DATA "TL -- LOAD A PICTURE FROM TAPE."
280 DATA "TS -- SAVE A PICTURE ON TAPE."
290 DATA "U -- TURN PICTURE UP-SIDE-DOWN."
295 DATA "V -- CREATE A BACKROUND OF VERTICAL LINES."
300 DATA "W -- CREATE WHITE SCREEN."
301 DATA ". -- SET UP AN ORIGIN AT CURSOR LOCATION FOR DRAWING LIN
ES."
302 DATA ",W -- DRAW LINE FROM ORIGIN TO CURSOR POSITION. (WHITE)"
303 DATA ",B -- DRAW LINE FROM ORIGIN TO CURSOR POSITION. (BLACK)"
310 DATA "X1 -- UTILITY PROGRAM #1.  (DRAW CIRCLES)."
330 DATA "X2 -- UTILITY PROGRAM #2.  (THIS PROGRAM)."
335 DATA "X3 -- UTILITY PROGRAM #3.  (ROTATE OR EXPLODE PICTURE)."
340 DATA " ","ARROWS -- MOVE CURSOR AND DRAW."
350 DATA "<SPACE BAR> -- REVERSE THE PIXEL THAT THE CURSOR IS COVE
RING."
360 DATA "<SHIFT> -- ALLOWS TO PROGRAM AND USE USER-DEFINABLE KEYS
.","*****  DON'T USE <SHIFT> WITHOUT READING MANUAL  *****"
370 DATA "<BREAK> CANCEL ANY FUNTION OR END PROGRAM."
380 DATA " "," ","T H I S  I S  T H E  E N D  O F  T H E  F U N C
T I O N  L I S T"
400 DATA "EOF"
```

End

Program Listing 4. UTIL3/BAS.

```
5 DIM P(128,48):CMD"B","OFF"
10 CLS:PRINT @520,"ROTATION OR EXPLOSION (PRESS R, E OR Q)"
20 I$=INKEY$:IF I$="" THEN 20
30 IF I$<>"R" AND I$<>"E" AND I$<>"Q" THEN 20
35 IF I$="Q" THEN CMD"I","GRAPH TEMP"
40 IF I$="E" THEN CLS:PRINT @520,"WHAT IS THE RADIUS OF THE EXPLOS
ION ";:GOTO 60
50 CLS:PRINT @520,"HOW MANY DEGREES OF ROTATION ";
60 INPUT B
65 IF I$="E" THEN C=B:B=0:ELSE C=0
70 B=B*3.141592654/180
85 IF F=1 THEN 180
90 CMD"L","LOAD/UTL"
100 DEFUSR0=&HF000
110 G=USR0(0)
120 XC=64:YC=24
140 FOR X=0 TO 127
150 FOR Y=0 TO 47
155 IF POINT(X,Y) THEN P(X,Y)=1
156 IF PEEK(14400)=4 THEN CMD"I","GRAPH TEMP"
160 NEXT Y
170 NEXT X
180 CLS
190 FOR X=0 TO 127
200 FOR Y=0 TO 47
210 IF P(X,Y)=1 THEN GOSUB 270
211 IF PEEK(14400)=4 THEN CMD"I","GRAPH TEMP"
220 NEXT Y
230 NEXT X
240 CMD"L","SAVE/UTL"
250 G=USR(0)
260 F=1:GOTO 10
270 XD=X-XC
280 YD=Y-YC
290 D=((XD*XD+YD*YD)[0.5)+C
300 IF XD=0 THEN XD=.00001
310 A=ATN(YD/XD)+B
320 IF XD<0 THEN A=A+3.1415
330 IF A>6.2832 THEN A=A-6.2832
340 X1=D*COS(A)+XC:Y1=D*SIN(A)+YC
350 IF X1>=0 AND Y1>=0 AND Y1<=47 AND X1<=127 THEN SET (X1,Y1)
360 RETURN
```

End

Program Listing 5. Load/SRC.

```
00100          ORG     0F000H
00110 START    LD      HL,NAME
00120          LD      DE,DCB
00130          LD      BC,24
00140          LDIR
00150          CALL    DLOAD
00160          RET
00480 DLOAD    LD      HL,BUFFER
00490          LD      DE,DCB
00500          LD      BC,0
00510          CALL    4424H
00520          RET     NZ
00530          LD      DE,DCB
00540          CALL    4436H
00550          LD      HL,BUFFER
00560          LD      DE,3C00H
00570          LD      BC,256
00580          LDIR
00590          LD      DE,DCB
00600          CALL    4436H
00610          LD      HL,BUFFER
00620          LD      DE,15616
00630          LD      BC,256
00640          LDIR
00650          LD      DE,DCB
00660          CALL    4436H
00670          LD      HL,BUFFER
00680          LD      DE,15872
00690          LD      BC,256
00700          LDIR
00710          LD      DE,DCB
00720          CALL    4436H
00730          LD      HL,BUFFER
00740          LD      DE,16128
00750          LD      BC,256
00760          LDIR
00770          LD      DE,DCB
00780          CALL    4428H
00790          RET
00800 NAME     DEFM    'TEMP/GRA'
00810          DEFB    0DH
00820 DCB      DEFS    100
00830 BUFFER   DEFS    256
00840          END     START
```

End

Program Listing 6. Save/SRC.

```
00100          ORG     0F000H
00110 START    LD      HL,NAME
00120          LD      DE,DCB
00130          LD      BC,24
00140          LDIR
00150          CALL    DSAVE
00160          RET
00170 DSAVE    LD      DE,DCB
00180          LD      HL,BUFFER
00190          LD      BC,0
00200          CALL    4420H
00210          LD      HL,3C00H
00220          LD      DE,BUFFER
00230          LD      BC,256
00240          LDIR
00250          LD      DE,DCB
00260          CALL    4439H
00270          LD      HL,15616
00280          LD      DE,BUFFER
00290          LD      BC,256
00300          LDIR
00310          LD      DE,DCB
00320          CALL    4439H
00330          LD      HL,15872
00340          LD      DE,BUFFER
00350          LD      BC,256
00360          LDIR
00370          LD      DE,DCB
00380          CALL    4439H
00390          LD      HL,16128
00400          LD      DE,BUFFER
00410          LD      BC,256
00420          LDIR
00430          LD      DE,DCB
00440          CALL    4439H
00450          LD      DE,DCB
00460          CALL    4428H
00470          RET
00800 NAME     DEFM    'TEMP/GRA'
00810          DEFB    0DH
00820 DCB      DEFS    100
00830 BUFFER   DEFS    256
00840          END     START
```

End

Program Listing 7. Display/SRC.

```
00100          ORG     7000H
00110 START    LD      A,(HL)
00120          CP      13
00130          JP      Z,402DH
00140          PUSH    HL
00150          CALL    EXTENS
00160          POP     HL
00170          LD      DE,DCB
00180          LD      BC,23
00190          LDIR
00200          CALL    DLOAD
00210 LOOP     LD      A,(14400)
00220          CP      1
00230          CALL    Z,NEGATI
00240          CP      4
00250          JP      Z,CLS
00260          JP      LOOP
00270 CLS      CALL    1C9H
00280          JP      402DH
00290 DLOAD    LD      HL,BUFFER
00300          LD      DE,DCB
00310          LD      BC,0
00320          CALL    4424H
00330          JP      NZ,402DH
00340          LD      DE,DCB
00350          CALL    4436H
00360          LD      HL,BUFFER
00370          LD      DE,3C00H
00380          LD      BC,256
00390          LDIR
00400          LD      DE,DCB
00410          CALL    4436H
00420          LD      HL,BUFFER
00430          LD      DE,15616
00440          LD      BC,256
00450          LDIR
00460          LD      DE,DCB
00470          CALL    4436H
00480          LD      HL,BUFFER
00490          LD      DE,15872
00500          LD      BC,256
00510          LDIR
00520          LD      DE,DCB
00530          CALL    4436H
00540          LD      HL,BUFFER
00550          LD      DE,16128
00560          LD      BC,256
00570          LDIR
00580          LD      DE,DCB
00590          CALL    4428H
00600          RET
00610 EXTENS   LD      A,(HL)
00620          INC     HL
00630          CP      13
00640          JP      NZ,EXTENS
00650          DEC     HL
00660          LD      A,'/'
00670          LD      (HL),A
00680          INC     HL
00690          LD      A,'G'
00700          LD      (HL),A
00710          INC     HL
00720          LD      A,'R'
00730          LD      (HL),A
00740          INC     HL
00750          LD      A,'A'
00760          LD      (HL),A
00770          INC     HL
00780          LD      A,0DH
00790          LD      (HL),A
00800          RET
00810          JP      EXTENS
00820 NEGATI   LD      HL,15360
00830          LD      BC,1024
00840 NEG      LD      A,(HL)
00850          CPL
00860          RES     6,A
00870          SET     7,A
00880          LD      (HL),A
00890          INC     HL
00900          DEC     BC
00910          LD      A,B
00920          OR      C
00930          RET     Z
00940          JP      NEG
00950 BUFFER   DEFS    256
00960 DCB      DEFS    100
00970          END     START
```

End

Circle 449 on Reader Service card.

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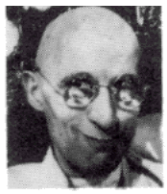

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*Model 3 requires LDOS
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See opposite page ▸▸▸▸▸▸

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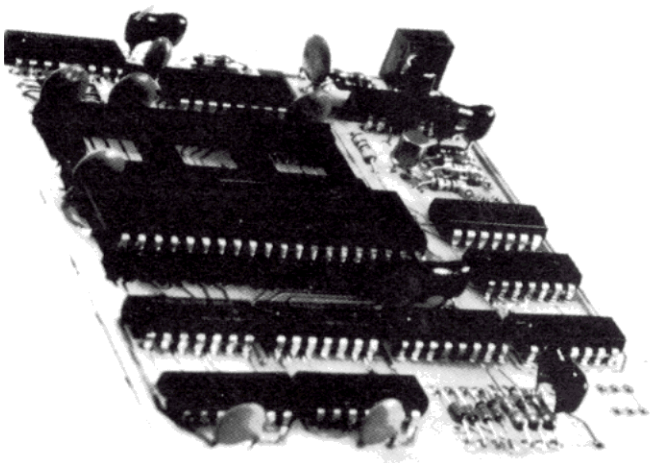
Double Density Controller



Add 80% more capacity to your disk system with the Double Density Controller (DDC) from Aerocomp.

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Some products have what it takes to seem to last forever. Our "DDC" is one of those products. What it does is allow you to operate your TRS-80 Model 1 disk system in double density. In this case double density means almost doubling the storage capacity of your diskettes. Single density, thats the way Radio Shack designed your Model I expansion interface, organizes your disk into 10 sectors per track. Each sector contains 256 bytes of data for a total storage capacity of 2,560 bytes or 2.5K per track times the number of tracks your drive is capable of addressing. Double density,on the other hand, writes 18 sectors per track each containing 256 bytes for a total of 4,608 bytes or 4.5K. That 80% more data in the same space. Why didn't Radio Shack do that in the beginning, you ask? Well it costs money to do double density because it is more difficult to do than single density and the data is harder to capture reliably. That means more cost and the Model I was meant to be a low-cost computer for the masses. Therefore, no double density.

The Facts

Other companies introduced double density controllers for the Model I but they were not so good. We waited and waited but, even new models failed to correct problems with data separation that kept cropping up. So we went to work and came up with a new design to cure the old problem. At last! A double density controller for the Model I with a higher probability of data recovery than with any other double density controller on the market then or since. Our analog design phase lock loop data separator has a wider capture window than the digital types the others use. This allows high resolution data centering. Our "DDC" analog circuit allows infinitely variable tuning. The attack and settling times are optimum for 5.25" diskettes. The oft-stated fears of adjustment problems have been proved groundless by thousands of satisfied users the world over. The bottom line here is state-of-the-art performance and reliability.

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40tk SS half high TEAC FD55-A.....129
40tk DS half high TEAC FD55-B.....169
80tk DS full size Tandon TM101-4 239
80tk DS half high TEAC FD55-F.....239
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All Systems Go For the BBS Express

With spring just around the corner, we figured we'd do a little spring cleaning for the BBS Express. This means taking care of some unfinished business.

Out first task is to publish the code you need to get your board up and running. The Program Listing gives you this code, while the Table outlines the functions of the individual lines.

Once you type in the listing, your board will be in working order: It welcomes, registers, and updates each user's record. In addition, it will display options in each of its menus that, in turn, direct callers to the proper section of the BBS.

Still missing from the BBS Express is the code for the data base catalog, which we'll include in next month's column. ■

Illustration by Roy Lewando

The BBS Express, 80 Micro's bulletin board system, is open 24 hours a day. Call us at 603-924-6985 to see the finished product. UART parameters are 300 baud, 7-bit words, one stop bit, and even parity.

You can reach J. Stewart Schneider and Charles E. Bowen either through their bulletin board at 606-739-6088 or c/o Saturday Software, P.O. Box 404, Catlettsburg, KY 41129.

System Requirements

Model III
48K RAM
Disk Basic
Two disk drives

Program Listing. BBS module.

```
1 REM            Towne Crier v. 2.0
2 REM            version date 5/19/13
3 REM           COPYRIGHT 1984 SCHNEIDER AND BOWEN
10 CLS:CLEAR5000:DEFINT A-Z:I$=STRING$(255,32):SR$=I$:LSETSR$=CH
R$(0):S$=STRING$(62,"-"):CK$=LEFT$(I$,20)
11 CH=(PEEK(-1)=1)
15 DIMI$,CT,CM$,Z,MR,X,A$,P1$,TL,N1$,E,ND,CK$,EN,RN,C$,ER,MN,NM,
F2$,S,SN,SY,A1,LN,LP$,MN$,RD,RP$,S7$,FL$,NA$,SV,AS,C1$,D$,FS
16DIMNC,PR,B$,HI,M,NV,SF$,SH,A2$,AC,M1$,N,SF,T1$,VW,Y,C2$,CC!,CR
,D1$,DF,F1,L,L1$,N5$,ND$,S1$,S2$,TT$,UA$,V1$,CA,DC$,NM$
17 DIMPF,PW$,S6$,S9$,SA$,SE$,SL,SL$,SM$,SP$,SV$,XA$,AD$,CT$,IN$,
K,RE,S8$,SC$,S$,SN$,SR$,T$,T2$,UH$,WZ,XL$,CA$,CV,M2,MX
18DIMNW$,OT$,P,P$,PM,RC,S$,SC,SS$,TN,U1$,U2$,U3$,U4$,UL$,B,C,CL$
,FD,HM,N$,P,TR,TT,U$,ZM$,A,DU$,G,L1,R,X$,Z9,DD$,SD$
20  DIM M(50),MG$(20),MG(20),F$(16),S$(16):DEFUSR0=&HFE00:DEFUSR
1=&HFE6C:DEFUSR2=&HFE7F:DEFUSR3=&HFEF1:TL=-1:NC=0:U$="%
       % ##### ACCESS:###"
30 PF=&HFF2A:POKE PF,255'      PRINTER FILTER SWITCH
40 MN=&HFE04:POKE MN,245'      MAX. RECD LINE LENGTH
50 FD=&HFEF5'                 SEARCH TARGET POKE
60 TT=&HFE45:TN=&HFE10:POKE TT,&H20:POKE TT+1,&H14:POKE TN,&H20:
POKETN+1,&H49'        TONE TEST SWITCHES
70 NP=&HFE2E:POKE NP,&H33'     NO PRINT SWITCH
80 RE=&HFEDD'                   CHAR. REMAINING ON VID LINE
90 VW=&HFEE0'                   VIDEO WIDTH
100 DEF FN FL$(X)=RIGHT$(STR$(X),LEN(STR$(X))-1):DD$=":1":SD$=":
0"
110 DEF FN P(R,A$)=CVI(MID$(A$,2*R-1,2))
```

Listing continued

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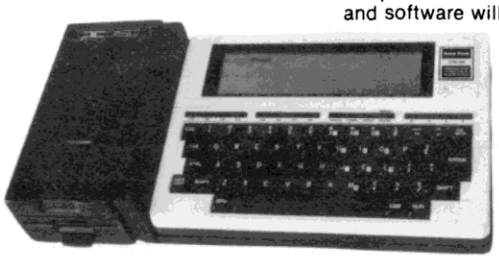

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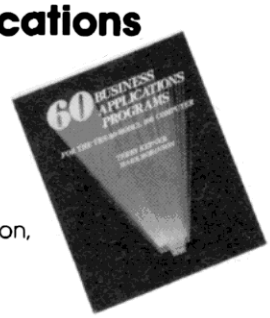

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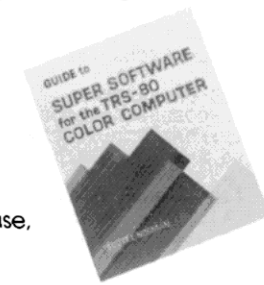

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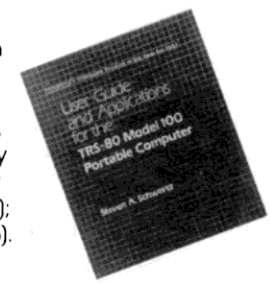

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Lines	Description
1-120	Defines variables and POKE locations, and dimensions arrays
130-180	Telecommunications input statement
300-340	Command processor
440-560	Handles message prompts
570-790	Alters user records
800-850	Section prompt and display
860	Creates file name and message number from A$
870-910	Locates records in membership log and data base catalog binary tree
820-930	Writes new users to disk
1090-1170	Collects new user information
1235	Calculates time
1240-1355	Retrieves system information from disk, prints title page, waits for caller or console command
1380-1620	Caller log-in routine
1630-1670	Checks caller's mailbox
1680-1730	Welcomes visitor, prints bulletin and main command prompt
1740-1890	Main command functions
1900-2620	Main SYSOP functions
2630-2720	Sign-off routine
2850-3270	Read and scan routines
5190	Error trap

Table. Line definitions for BBS module.

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Listing continued

```
120 GOTO1240
130 LSET I$=" "
140 CT=USR0(VARPTR(I$)):IF CT=-1 THEN 2630
150 CR=INSTR(I$,CHR$(13)):IF CR=0 THEN 170
160 IF NC THEN MID$(I$,CR,1)=CHR$(141) ELSECT=CR-1:MID$(I$,CR,1)
=CHR$(32)
170 IF TL THEN Z=USR1(VARPTR(I$))
180 RETURN
300 IF LEN(CM$)<=1 THEN C$=CM$:CM$="":RETURN
310 C$=LEFT$(CM$,1):CM$=RIGHT$(CM$,LEN(CM$)-1):IF (C$<=CHR$(32))
 OR(C$=";") THEN 300
320 IF CM$=""THEN RETURN
330 IF (ASC(CM$)<=32) OR (ASC(CM$)=59) THENCM$=RIGHT$(CM$,LEN(CM
$)-1):GOTO320
340 RETURN
440 IF (SF) THEN RETURN ELSE RC=0:IF ((LEFT$(T$,5)="SYSOP") AND
SY) OR(LEFT$(T$,LEN(NA$))=NA$) THEN RC=-1
450 K=RC:IF (LEFT$(TT$,LEN(NA$))=NA$) OR (SY) THEN K=-1
460 IF RC THEN S7$=CHR$(ASC(S7$) OR 16):LSET S2$=CHR$(ASC(S7$) O
RASC(S9$)):PUT 1,RN
465 IF (BM) OR (PR) THEN RETURN
470 PRINT"(C RE T)";:IF K THEN PRINT"(D = DELETE)";
480 IF SY THEN PRINT"(P = PRINT IT)";
490 GOSUB130:PRINTCHR$(17);
500 IF SY AND ASC(I$)=80 THEN PR=-1:GOSUB4720:PR=0:GOTO470
510 IF LEFT$(I$,1)="T" THEN RN=E:RETURN
520 IF LEFT$(I$,2)="RE" THEN GOTO3380
530 IF NOT((LEFT$(I$,1)="D") AND K) THEN 545
540 PRINT"Please confirm delete (y/n)";:GOSUB130:PRINTCHR$(17):I
F ASC(I$)=89 THEN MID$(MN$,2*RN-1,2)=MKI$(-FNP(RN,MN$)):PRINT"De
leted":MID$(I$,1,1)="C"
545 IF LEFT$(I$,1)="C"THEN RETURN
550 PRINT"C = Continue":PRINT"RE = REply to message":PRINT"T = T
op (ExitRead Function)":IF K THEN PRINT"D = Delete message"
560 GOTO470
570 GET 2,MR:PRINTCHR$(12);
580 PRINT"Name: ";N1$
590 PRINT"1. Street Address: ";A1$
600 PRINT"2. City/State: ";C1$:PRINT"3. Video Width: ";CVI(V1$):
PRINT"4.Line Feeds: ";L1$:PRINT"5. PASSWORD: ";P1$:PRINT"6. ACCE
SS: ";A2$
610 PRINT"Number of calls: ";CVI(C2$):PRINT"Number of messages:"
;CVI(M1$)
620 PRINT:PRINT"Tap ENTER to record":PRINT"Type a number to alte
r";
630 GOSUB130:PRINTCHR$(17):IF CT=0 THEN CLOSE:RETURN
640 IF VAL(I$)>6 OR VAL(I$)<1 THEN 620
650 ONVAL(I$)GOSUB670,690,710,730,760,780
660 PUT 2,MR:GOTO570
670 TL=0:PRINT"Address: ";:GOSUB130:TL=-1:PRINTCHR$(17):IF CT>0
THENLSETA1$=I$
680 RETURN
690 TL=0:PRINT"City/State: ";:GOSUB130:TL=-1:PRINTCHR$(17):IF CT
>0 THENLSETC1$=I$
700 RETURN
710 PRINT"Video Width: ";:GOSUB130:PRINTCHR$(17):IF VAL(I$)>20 A
NDVAL(I$)<255 THEN LSET V1$=MKI$(VAL(I$)):IF M=MR THEN SV=VAL(I$
):POKEVW,SV
720 RETURN
730 IF L1$="Y" THEN LSET L1$="N" ELSE LSET L1$="Y"
740 IF MR=M THENUL$=L1$:IF L1$="Y" THEN POKE PF,255 ELSE POKE PF
,0
750 RETURN
760 PRINT"PASSWORD: ";:GOSUB130:PRINTCHR$(17):IF CT>0 LSETP1$=I$
770 RETURN
780 IF SY THEN PRINT"Access: ";:GOSUB130:PRINTCHR$(17):LSET A2$=
I$
790 RETURN
800 PRINT"Section (Tap ENTER for all, ? forlist)";:GOSUB130:PRIN
TCHR$(17);
810 IF CT=0 THEN SE$=UA$:RETURN
820 IFASC(I$)=63THENGOSUB830:GOTO800
821SE$=LEFT$(I$,CT):FORZ=1TOCT:IFINSTR(UA$,MID$(SE$,Z,1))=0THENP
RINT"Unauthrized to Section ";MID$(SE$,Z,1):GOTO800ELSENEXT:RETU
RN
830 FOR Z=1 TO 15:IF (S$(Z)=STRING$(16,32)) OR(INSTR(UA$,MID$("0
123456789ABCDE",Z,1))=0) THEN 850
840 PRINT MID$("0123456789ABCDE",Z,1);" ";S$(Z)
850 NEXT:RETURN
860 N$=FN FL$(MN):MID$(A$,INSTR(A$,"/")-LEN(N$),LEN(N$))=N$:RETU
RN
870 Y=1:IFEN=1 THEN RETURN
880 GET 2,Y
890 IF CK$>N1$ THEN FS=CVI(RP$):IF FS=0 THEN LSET RP$=MKI$(EN-Y)
```

Listing continued

Listing continued

```
:PUT2,Y:RETURN
900 IF CK$<=N1$ THEN FS=CVI(LP$):IF FS=0 THEN LSET LP$=MKI$(EN-Y
):PUT2,Y:RETURN
910 Y=Y+FS:GOTO880
920 LSET N1$=N5$:LSET A1$=AD$:LSET C1$=CT$:LSET L1$=CL$:LSETA2$=
CA$:LSET M1$=MKI$(0):LSET C2$=MKI$(1):LSET P1$=PW$:LSETUH$=MKI$(
0):LSET V1$=MKI$(CV):LSET LP$=MKI$(0):LSET RP$=MKI$(0)
930 PUT 2,NM:RETURN
1090 N5$="":TL=-1:PRINT"Name: ";:GOSUB130:PRINTCHR$(17):IF CT=0
THENRETURN ELSE N5$=LEFT$(I$,CT)
1100 LSET CK$=N5$:EN=NM:GOSUB940:IF NOT ER THEN PRINT"Name inuse
.":PRINT"Please add an initial.":GOTO1090
1110 TL=0:PRINT"Street Address: ";:GOSUB130:PRINTCHR$(17):IF CT>
0 THENAD$=LEFT$(I$,CT) ELSE 1110
1120 PRINT"City/State/Zip: ";:GOSUB130:PRINTCHR$(17):IF CT>0 THE
NCT$=LEFT$(I$,CT) ELSE 1120
1130 CLS:PRINTCHR$(12);N5$:PRINTAD$:PRINTCT$:PRINT:PRINT"Is this
 correct(y/n)?";
1140 TL=-1:GOSUB130:PRINTCHR$(17)
1150 IF ASC(I$)=78 THEN 1090 '    "NO"
1160 IF ASC(I$)<>89 THEN 1140 '  INCORRECT RESPONSE
1170 RETURN
1235T!=VAL(MID$(TM$,10))*3600+VAL(MID$(TM$,13))*60+VAL(MID$(TM$,
16)):RETURN
1240 ONERRORGOTO5190
1250 FORX=1TO20:MG$(X)=STRING$(80,32):NEXT
1260 GOSUB190
1270 GET 3,1
1280SL=CVI(SL$):SH=CVI(SH$):CA$=SA$:CV=CVI(SV$):SN=CVI(SN$):PW$=
SP$:CL$=SF$:X=CVI(SM$):SC=CVI(SC$):ND=CVI(ND$):NM=CVI(NM$):DS=CV
I(DS$)
1290 POKE VW,SV:IF UL$="N" THEN POKE PF,0
1300 GOSUB210
1310 GET3,2
1320 FOR X=1TO16:S$(X)=F$(X):NEXT
1330 FIELD 3,255 AS ZM$:GET 3,3:MN$=LEFT$(ZM$,2*SN):CLOSE
1340 CLS:FOR X=0 TO 127:SET(X,0):SET(X,47):IF X<48 THENSET(0,X):
SET(127,X):NEXT ELSE NEXT:PRINT@130,TIME$;
1350 PRINT@334,"The Saturday Software BulletinBoard";:PRINT@410,
"Version 2.0";:PRINT@452,"Copyright (c) 1984 by J.Stewart Schnei
der and C. E. Bowen";:PRINT@178,"Chat Mode";:IFCHTHENPRINT"ON ";
ELSEPRINT"OFF";
1355 PRINT@587,"<S>et Date/Time                <C>hat Toggle";:PR
INT@651,"<L>ocal Operation              <E>xit Towne Crier";
1360 IF (INP(&HE8)AND32)=0 THEN 1380
1365 A$=INKEY$:N=PEEK(&H387F):IFN=0THEN1360
1375 IFA$<>""THENA$=CHR$(ASC(A$)AND95):GOTO6500 ELSE1360
1380 CLS:PRINT:PRINTCHR$(12);"Hello, and welcome to":PRINT"the T
he TowneCrier BBS! (Ver. 2.0)":PRINT:PRINT
1390 FOR X=1 TO 5
1400 IFINKEY$<>""THEN1400
1410 NEXT:IN$=TIME$:TM$=IN$:GOSUB 1235:IN!=T!
1420 CLOSE:PRINT"Are you a first-time visitor?(y/n)";:GOSUB130:P
RINTCHR$(17)
1430 IF ASC(I$)=89 THEN 1530 ' YES
1440 IF ASC(I$)<>78 THEN 1420
1450 PRINT"Name: ";:GOSUB130:PRINTCHR$(17):IF CT=0 THEN 1420 ELS
ENA$=LEFT$(I$,CT)
1460 PRINT"Checking Membership Log...":CLOSE:GOSUB240:LSETCK$=NA
$:EN=NM:GOSUB940
1470 IF ER THEN PRINT"Not recorded":GOTO1420
1480 IF PW$=P1$ THEN 1515
1490 FOR TR=1 TO 3:PRINT"PASSWORD: ";
1500POKENP-1,0:POKENP,0:GOSUB130:PRINTCHR$(17):POKENP-1,&HCD:POK
ENP,&H33
1510 IF LEFT$(I$,16)<>P1$ THEN 1520
1515M=MR:AD$=A1$:CT$=C1$:SV=CVI(V1$):M2=CVI(M1$):UA$=A2$:HI=CVI(
UH$):HM=HI:I L1$="N"THEN POKE PF,0 ELSE POKE PF,255
1516 GOTO1630
1520 NEXT:PRINT"INVALID LOGIN":GOTO1420
1530 IF LEFT$(PW$,8)="PASSWORD" THEN 1600
1540 FOR TR=1 TO 3
1550 PRINT"System password? ";:GOSUB130:PRINTCHR$(17)
1560 IF LEFT$(I$,16)=PW$ THEN 1600
1570 NEXT:PRINT"Invalid login"
1580 PRINT"Board closed to unauthorized persons.":PRINT"Please h
ang up."
1590 GOSUB130:GOTO1590
1600 GOSUB240:GOSUB1090:IF N5$="" THEN 1420 ELSE NA$=N5$
1610 SV=CV:POKE VW,SV:UA$=CA$:NM=NM+1:GOSUB920:M=NM:IF M>1 THENE
N=M:GOSUB870
1620 MR=M:GOSUB570:CLOSE
1630 IF (WZ) OR (INSTR(UA$,"*")>0) THEN UA$="0123456789ABCDE*":S
Y=-1
1640 SE$=UA$:Q$="ALL"+CHR$(128):PRINT"One momentplease...":PRINT
```

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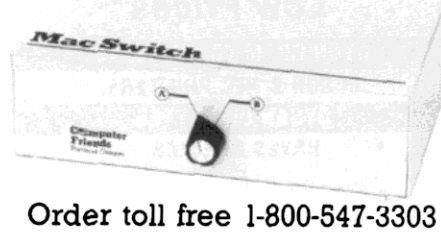

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```
"Checking your mailbox.":GOSUB220:SF=-1:MN=HI+1:GOSUB430
1650 FOR RN=S TO SN:PRINT".";:GET1,RN:L=20:IF (ASC(S2$) AND 16)=
16 THEN1670
1656 IF (L>0) AND (MID$(T1$,L,1)=" ")THEN L=L-1:GOTO 1656
1660 IF (SY AND (LEFT$(T1$,5)="SYSOP")) OR (LEFT$(T1$,L)=NA$) OR
(LEFT$(T1$,LEN(Q$))=Q$) THENGOSUB350:IFRD THEN PRINT:PM=PM+1:M(P
M)=RN:GOSUB4720
1670 NEXT:CLOSE:SF=0:IF PM>0 THEN PRINT"These message(s)":PRINT"
havebeen marked for retrieval":PRINT"Using the RM command.":PRIN
T
1680 PRINT"You are caller";SC:PRINT"SYSTEM CONTAINS";SN;"MESSAGE
S FROM"SL"TO"SH
1690 IF M>0 THEN PRINT"HIGH MESSAGE RETRIEVED: ";HI
1700 POKE VW,SV:IF UL$="N" THEN POKE PF,0
1710 F2$="BULLETIN":GOSUB4850
1720 SF=0:TL=-1:NC=0:CLOSE
1730 PRINT:PRINT"Command (? for HELP): ";:GOSUB130:PRINTCHR$(17)
:IF CT=0THEN 1730
1740 CM$=LEFT$(I$,CT):GOSUB300
1750ONINSTR("$RSLECXMUHBT",C$)GOTO1900,2865,2850,3280,2630,1790,
3710,1810,180,1780,1774,1777
1760 PRINT"? - Prints this list":PRINT"R - Read Messages":PRINT"
L -Leave a message":PRINT"S - Scan the messages":PRINT"E - Exit
theBBS":PRINT"C - Change Member's Record":PRINT"X - Database"
1770 PRINT"M - Scroll membership log":PRINT"U - Scroll user log"
:PRINT"H- View HELP file":PRINT"B - Set/Reset Brief Mode":PRINT"
    (No stopbetween messages)":PRINT"T - Talk to SYSOP":GOTO1720
1774 BM=(BM=0):PRINT"Brief mode ";:IF BM THEN PRINT"ON"ELSEPRINT
"OFF"
1776 GOTO1720
1777 IFNOTCHTHENPRINT"SYSOP not available":GOTO1720
1778 PRINT"PagingSYSOP.";:FORX=1TO10:PRINT".";:FORT=1TO50:IFPEEK
(&H387F)=0THENNEXTT,X:PRIT:PRINT"SYSOP doesn't answer.  Sorry":G
OTO1720ELSEPRINT"Control-P toexit CHAT"
1779 GOSUB130:PRINTCHR$(17);:IFINSTR(I$,CHR$(16))=0THEN1779ELSE1
720
1780 F2$="HELP":GOSUB4850:GOTO1720
1790 PRINT"Change Member's Record":GOSUB240
1800 MR=M:GOSUB570:GOTO1720
1810 GOSUB240:PRINT"Control-P to stop"
1820 FOR X=1 TO NM:GET 2,X
1830 PRINTN1$:PRINTC1$:PRINT
1840 IF INKEY$<>CHR$(16) THEN NEXT
1850 PRINT"Job done":CLOSE:GOTO1720
1860 GOSUB280:IF LOF(3)=0 THEN 1720 ELSEPRINT"Control-P to Stop"
:FORX=LOF(3) TO 1 STEP-1:GET 3,X:PRINTU1$:PRINT"IN: ";U2$:PRINT"
OUT:";U3$:PRINT"ELAPSED:    ";U4$:PRINT
1870 IF INKEY$=CHR$(16) THEN X=1
1880 NEXT
1890 GOTO1720
1900 IF NOT SY THEN 1720
1910 IFCM$<>""THEN 1930
1920 CLOSE:PRINT"SYSOP Commands (?=HELP): ";:GOSUB130:PRINTCHR$(
17):IFCT=0 THEN 1920 ELSE CM$=LEFT$(I$,CT)
1930 GOSUB300
1940ONINSTR("MACDELPSN$BFK",C$)GOTO2030,2100,2200,2130,1720,2240
,2570,2310,210,1980,1990,1975,1976
1950 PRINT"? - Prints this list":PRINT"A - Add New Member":PRINT
"C -Change User Record":PRINT"D - Delete User Record":PRINT"K -
Kill ERRORand USER logs"
1960 PRINT"E - Exit Sysop Function":PRINT"L - Print MailingLabel
s":PRINT"N - Set Section Names":PRINT"S - Examine/Change SystemD
efaults"
1970 PRINT"P - Purge Retrieved message":PRINT"M - Membershiplog"
:PRINT"B - Write Bulletin":PRINT"F - Rewrite Membership FilePoin
ters":GOTO1920
1975GOSUB240:E=NM:GOSUB5270:NM=NV:GOSUB190:GET3,1:LSETNM$=MKI$(N
M):PUT3,1:CLSE:GOTO1920
1976 KILL"ERROR/BBS"+SD$:OPEN"O",1,"ERROR/BBS"+SD$:PRINT#1,"ERRO
RLOG":CLOSE:KILL"USER/BBS"+SD$:GOTO1900
1980 STOP:GOTO 1720
1990 B=-1:GOSUB3380:B=0:OPEN"O",3,"BULLETIN/BBS"+DD$
2000 FOR Z=1TOLN
2010 IF MG(Z)>0 THEN PRINT#3,LEFT$(MG$(Z),MG(Z));
2020 NEXT Z:CLOSE 3:GOTO1920
2030 GOSUB1230
2040 GOSUB240
2050 FOR MR=1 TO NM:GET2,MR
2060 PRINTN1$:PRINTA1$:PRINTC1$:PRINT"PASSWORD: ";P1$:PRINT"Acce
ss:";A2$:PRINT"No. of Calls: ";CVI(C2$):PRINT"Number of Messages
:";CVI(M1$):PRINT
2070 IF PR THEN LPRINTN1$,"Password: ";P1$:LPRINTA1$,"Access:";A
2$:LPRINTC1$,"No. of Calls: "CVI(C2$):LPRINT"Video:";CVI(V1$),,"
Number of Messages: ";CVI(M1$):LPRINT"line feeds:";L1$:LPRINT" "
2080 IF INKEY$<>CHR$(16) THEN NEXT
```

Listing continued

Listing continued

```
2090 PRINT"Job done":CLOSE:GOTO1920
2100 PRINT"Add new member selected":GOSUB240:GOSUB1090:IF N5$=""
THEN1900
2110 NM=NM+1:GOSUB920:MR=NM:IF MR>1 THEN EN=MR:GOSUB870
2120 GOSUB570:CLOSE:GOTO1920
2130 CLS:PRINTCHR$(12)"Delete User Record":GOSUB240
2140 PRINT"User Name: ";:GOSUB130:PRINTCHR$(17):IF CT=0 THEN 219
0 ELSELSET CK$=I$
2150 EN=NM:GOSUB940:IF ER THEN PRINT"No such record":GOTO2140
2160 PRINT"Deleting ";N1$:PRINT"Confirm (y/n)? ";:GOSUB130:PRINT
CHR$(17)
2170 IF ASC(I$)=89 THEN DF=-1:LSET P1$=CHR$(0):PUT 2,MR
2180 GOTO2140
2190 IF DF THEN E=NM:GOSUB5270:NM=NV:GOSUB190:GET 3,1:LSETNM$=MK
I$(NM):PUT 3,1:DF=0
2195 GOTO1920
2200 CLS:PRINTCHR$(12)"Change User Record":GOSUB240
2210 PRINT"User Name: ";:GOSUB130:PRINTCHR$(17):IF CT=0 THEN 192
0 ELSELSET CK$=I$
2220 EN=NM:GOSUB940:IF ER THEN PRINT"No such record":GOTO2210
2230 GOSUB570:GOTO1920
2240 CLS:PRINTCHR$(12);"Mailing Labels."
2250 GOSUB1230:IF NOT PR THEN PRINT"PRINTER NOT READY!!":GOTO192
0
2260 GOSUB240
2270 FOR MR=1TONM:GET2,MR
2280 LPRINT N1$:LPRINT A1$:LPRINT C1$:LPRINT" ":LPRINT" ":LPRINT
" "
2290 IF INKEY$<>CHR$(16) THEN NEXT
2300 PRINT"Job done":CLOSE:GOTO1920
2310 CLS:PRINTCHR$(12):GOSUB190
2320 GET 3,1:PRINT"1. Video width: ";CVI(SV$):PRINT"2. Line feed
s:";SF$:PRINT"3. Default Access: ";SA$:PRINT"4. Maximum messages
:";CVI(SM$):PRINT"5. System Password: ";SP$
2330 PRINT"6. Hard copy ";:IF PR THEN PRINT"On" ELSE PRINT"Off"
2340 PRINT"Tap ENTER to record":PRINT"TYPE A NUMBER TO ALTER"
2350 GOSUB130:PRINTCHR$(17):IF CT=0 THEN CLOSE:GOTO1910
2360 IF VAL(I$)<1 OR VAL(I$)>6 THEN 2320
2370 ON VAL(I$) GOTO2390,2410,2430,2450,2470,2490
2380 PUT 3,1:GOTO2320
2390 PRINT"VIDEO WIDTH: ";:GOSUB130:PRINTCHR$(17):IF (CT>0) AND(
VAL(I$)>0) AND (VAL(I$)<81)THEN LSET SV$=MKI$(VAL(I$))
2400 GOTO2380
2410 IF PEEK(PF)=255 THEN POKE PF,0:LSET SF$="N" ELSE POKE PF,25
5:LSETSF$="Y"
2420 GOTO2380
2430 PRINT"SYSTEM ACCESS: ";:GOSUB130:PRINTCHR$(17):IF CT>0THEN
LSETSA$=I$
2440 GOTO2380
2450 PRINT"MAXIMUM MESSAGES: ";:GOSUB130:PRINTCHR$(17):IF (CT>0)
 AND(VAL(I$)>10) AND (VAL(I$)<100) THEN LSET SM$=MKI$(VAL(I$)):M
X=VAL(I$)
2460 GOTO2380
2470 PRINT"System password: ";:GOSUB130:PRINTCHR$(17):IF CT>0 TH
EN LSETSP$=I$
2480 GOTO2380
2490 IF PR THEN PR=0 ELSE PR=-1
2500 GOTO2380
2510 PRINT"Tap ENTER to leave unchanged":PRINT"or type new heade
r.":TL=0
2520 FOR X=1 TO 15:PRINTMID$("0123456789ABCDE",X,1);" ";S$(X)
2530 GOSUB130:PRINTCHR$(17):IF CT=0 THEN 2560
2540 IF ASC(I$)=16 THEN X=15:GOTO2560
2550 LSET S$(X)=I$
2560 NEXT:GOSUB190:GOSUB210:FORX=1 TO 15:LSET F$(X)=S$(X):NEXT:P
UT3,2:CLOSE:TL=-1:GOTO1920
2570 GOSUB220
2580 PRINT"Ready to PURGE recovered messages.":PRINT"Confirm(y/n
)?";:GOSUB130:PRINTCHR$(17):IF ASC(I$)<>89 THEN 1900
2590 PRINT"WORKING";:FOR RN=1 TO SN:GET 1,RN
2600 IF (ASC(S2$) AND 16) =16 THEN MID$(MN$,2*RN-1,2)=MKI$(-FNP(
RN,MN$))
2610 PRINT".";
2620 NEXT:PRINT:CLOSE:GOTO1920
2630 CLOSE:PRINTCHR$(17);"Thanks for calling The Towne Crier.":P
RINT"Docall again.":PRINT"Arrival: ";IN$:OT$=TIME$:PRINT"Leaving
:";OT$:TM$=OT$:GOSUB 1235
2640 E!=T!-IN!:Z=INT(E!/3600):E!=E!-Z*3600:Y=INT(E!/60):X=CINT(E
!-Y*60)
2650 A$=FN FL$(Z):B$=FN FL$(Y):C$=FN FL$(X)
2660 IF LEN(A$)<2 THEN A$="0"+A$:GOTO2660
2670 IF LEN(B$)<2 THEN B$="0"+B$:GOTO2670
2680 IF LEN(C$)<2 THEN C$="0"+C$:GOTO2680
2690 PRINT"Elapsed time        ";A$;":";B$;":";C$
2700 PRINT"Please hang up now."
2710 IF M>0 THEN GOSUB240:GET2,M:LSET UH$=MKI$(HI):LSETC2$=MKI$(
```

Listing continued

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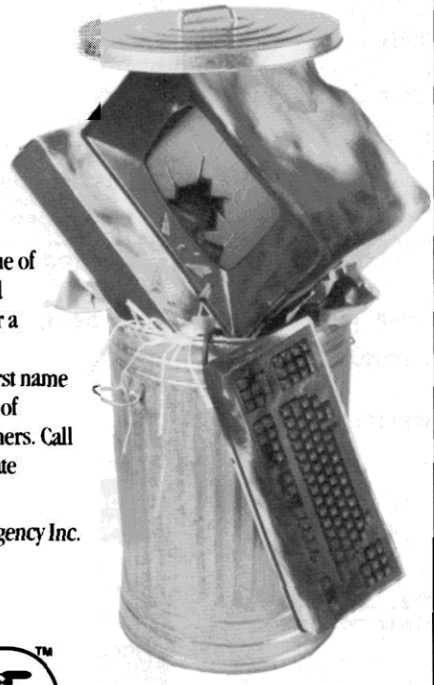

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Listing continued

```
CVI(C2$)+1):LSET M1$=MKI$(M2):PUT 2,M:CLOSE
2720 GOSUB280:LSET U1$=NA$:LSET U2$=IN$:LSET U3$=OT$:LSETU4$=A$+
":"+B$+":"+C$:PUT 3,LOF(3)+1:CLOSE
2850 CLS:PRINTCHR$(12);"SCANNING MESSAGE BOARD"
2860 PRINT"Enter a control-C to stop.":SF=-1
2865 IF SN=0 THEN PRINT"No messages available":GOTO 1720
2870 IFCM$<>""THEN2890
2880 PRINT"SUBCOMMAND (? for HELP): ";:GOSUB130:PRINTCHR$(17):IF
 CT=0THEN 1720 ELSE CM$=LEFT$(I$,CT)
2890 GOSUB300:D$=C$:IF D$="M" THEN 2970
2900 IF INSTR("FRISMN",D$)=0 THEN D$="?"
2910 IF D$="?" THEN PRINT"? - Prints this list":PRINT"F -Forward
":PRINT"R - Reverse"
2920 IF D$="?" THEN PRINT"I - Individual":PRINT"S - Selected":PR
INT"M -Marked":PRINT"N - New Messages":GOTO2880
2930 IF D$="N" THEN MN=HM+1:D$="F":GOTO2970
2940 MN=VAL(CM$):IF MN>0 THEN 2970
2950 PRINT"System contains messages"SL"to"SH:IF D$="I" THEN PRIN
T"Readwhich message?"; ELSE PRINT"Read starting with which messa
ge?"
2960 GOSUB130:PRINTCHR$(17):MN=VAL(I$)
2970 SE$=UA$:GOSUB220:IF D$<>"I" AND D$<>"M" THEN GOSUB800
2980 ON INSTR("FRISM",D$) GOTO2990,3040,3090,3130,3220
2990 E=SN:GOSUB430
3000 FOR RN=S TO E:GET 1,RN:GOSUB350:IF NOT RD THEN PRINT".";:GO
TO3020
3010 PRINT:GOSUB4720:GOSUB440:IF N>HI THEN HI=N
3020 IF INKEY$=CHR$(3) THEN RN=E
3030 NEXT:GOTO1720
3040 E=1:GOSUB430
3050 FOR RN=S TO E STEP-1:GET 1,RN:GOSUB350:IF NOT RD THENPRINT"
.";:GOTO3070
3060 PRINT:GOSUB4720:GOSUB440:IF N>HI THEN HI=N
3070 IF INKEY$=CHR$(3) THEN RN=E
3080 NEXT:GOTO1720
3090 GOSUB430:IF FN P(S,MN$)<>MN THEN PRINT"NO SUCH MESSAGE":GOT
O1720
3100 RN=S:GET 1,RN:GOSUB350
3110 IF RD THEN GOSUB4720:GOSUB440:IF N>HI THEN HI=N
3120 GOTO1720
3130 PRINT"Search field:(T,F,S)";:GOSUB130:PRINTCHR$(17):IF CT=0
 THEN1720 ELSE C$="F"
3140 SF$=LEFT$(I$,1):IF INSTR("TFS",SF$)=0 THEN 3130
3150 PRINT"Search for:";:GOSUB130:PRINTCHR$(17):SS$=LEFT$(I$,CT)
:PRINT"Searching";
3160 E=SN:GOSUB430
3170 FOR RN=S TO E:GET 1,RN:GOSUB350:IF NOT RD THEN PRINT".";:GO
TO3200
3180 PRINT:GOSUB4720:GOSUB440:IF N>HI THEN HI=N
3190 PRINT".";
3200 IF INKEY$=CHR$(3) THEN RN=E
3210 NEXT:SF$="":SS$="":GOTO1720
3220 E=PM:IF E=0 THEN PRINT"No Marked Messages":GOTO1720
3230 FOR X=1 TO E:RN=M(X):GET 1,RN:GOSUB350
3240 GOSUB4720:GOSUB440:IF N>HI THEN HI=N
3250 IF LEFT$(I$,1)="T" THEN X=E
3260 IF INKEY$=CHR$(3) THEN X=E
3270 NEXT:GOTO1720
3305 IF (TT$="ALL") AND (SY) THEN TT$=TT$+CHR$(128)
5190 IF ERL=4450 THEN PRINT"File not found":CLOSE:RESUME 4430
5200 IF ERL=4450 THEN PRINT"No such file":CLOSE:RESUME 4430
```

End

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Make Your Programs Go in Circles

A Basic loop is a series of program lines that execute in a closed cycle a specified number of times before the program continues. *This month I'll demonstrate how to* use loops to create a pause in a program; construct a counter; and enter, set, and search for values in your Basic programs.

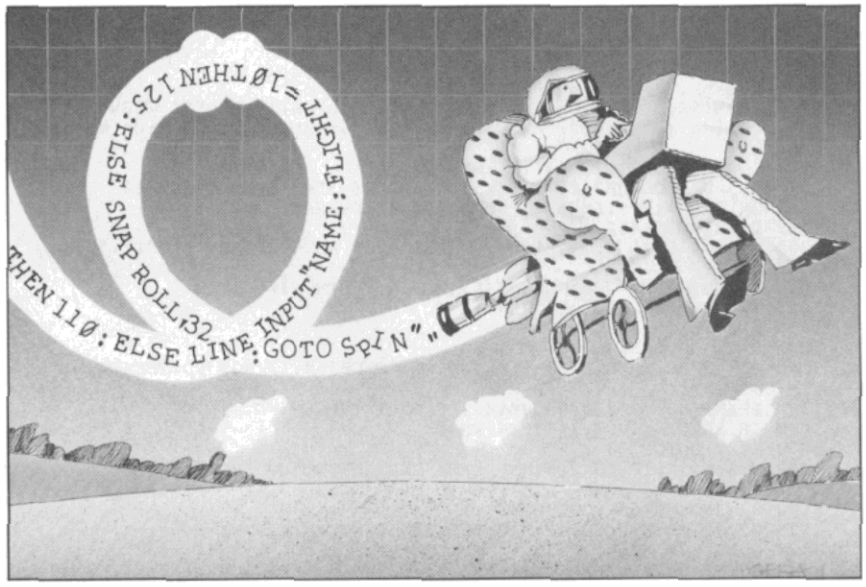

Illustration by Phil Geraci

Creating Loops

To write a Basic loop, you can use *For...Next*, GOTO, and *If...Then* statements. Here's an example:

```
100 PRINT "Why are you looking at this?"
110 GOTO 100
```

This program creates an endless loop; that is, the GOTO statement makes the program repeat endlessly. People sometimes create endless loops as *practical jokes, to vex users who don't* know how to exit a program.

If...Then loops let you bail out of a loop and continue the program once the program meets the conditions of the If...Then test. More on these later.

For...Next loops make a program *segment repeat a set number of times.* Two common applications of For... Next loops are timing and counting functions.

Timing Loops

The simplest kind of loop is a timer:

```
100 FOR X = 1 TO 500: NEXT X
```

The Model III executes this timer loop in about one second. Timer loops give a program rhythm, make a program wait for user response, or display material for a set amount of time before *continuing.*

Loops can count things other than time. For example:

```
100 CLS:FOR X = 1TO20: PRINTX;: NEXTX:
  END
```

This line counts to 20. A loop can count almost indefinitely:

```
100 CLS: FOR X = 1TO4.25353E + 37:
  PRINTX: NEXTX
```

If you run the listing above, you'll wait to the crack of doom (figuratively speaking) for it to finish. Press the break key to stop it.

Counting in Step

Basic counts a loop by increments, or steps, greater than or less than 1. Programs can count by whole numbers:

```
100 FOR X = 1TO1000 STEP10: PRINTX;:
  NEXTX
```

or by fractions:

```
100 CLS: FOR X = 1TO10 STEP .5: PRINTX;:
  NEXTX
```

Loops can also count backward by whole or fractional steps:

```
100 CLS: FOR X = 100 TO 1 STEP -1:
  PRINTX;: NEXTX
```

Here are a few rules to remember: Loops counting forward can do so in increments of 1 without using the Step command. Step is necessary when counting forward by fractions *or by increments greater than 1.* Counting backwards requires using Step with subtraction, even if you're decrementing only by 1.

You can use variables within loops, but you must define the variables before the loop:

```
100 CLS: INPUT "Start number";A
110 INPUT "Finish number";B
120 INPUT "Step number";C
130 FOR X = A TO B STEP C: PRINT X;:
  NEXT X
```

In this program, you enter a starting number, ending number, and a step number; the program counts according to your input.

Try running this program several times, using different numbers. If you enter 100, 200 and 3, the loop counts to 199. Basic counts as close to the ending number as possible, given the step number.

Input 200, 100, and −2 to count backward by twos from 200 to 100. Enter 200, 100, and 2 and the program won't go far. Can you see why?

Reading Arrays

For...Next loops are also useful for reading array values:

```
100 REM * My Grades
110 DATA 79,64,81,72,51
120 CLS: DIM G(5): FOR X = 1 TO 5:
  READ G(X): NEXT X
```

```
130 PRINT "I had five calculus tests."
140 INPUT "For which do you wish to
  see my grade";X
150 X=INT(X): IF X<1 OR X>5
  THEN CLS: GOTO 130
160 PRINT "I GOT A SCORE OF "G(X)"
  on test "X: GOTO 130: END
```

The loop in My Grades reads the data values in line 120 and displays them in response to your input.

Without using data lines, you can set sequential and random values with a loop. Here's an example of setting values sequentially:

```
100 CLS: DIM A(200): FOR X=23TO69*2
  STEP 69*2/3: A(X)=X: PRINT A(X);:
  NEXT
```

This line sets random values:

```
100 DIM A(20): FOR X=1TO20:A(X)=
  RND(0): PRINT A(X);:NEXTX
```

Nested Loops

In all the above examples, the loops end with a Next X statement. In single loops, you can end loops with Next alone; Basic knows which loop variable is at work.

In some programs, however, hundreds of lines can separate For and Next statements. I suggest including a variable with Next to keep program flow clear. The following program, Nested Loops, shows how confusion can occur.

```
100 REM *Nested Loop
110 CLS
120 FOR A=1 TO 3
130 FOR B=1 TO 3
140 PRINT A;B "/";
150 NEXT B
160 NEXT A
```

Loop A (lines 120–160) repeats three times; loop B (lines 130–150) is inside loop A and repeats three times for every execution of loop A. The resulting number sequence should make this clear.

Change the last two lines to read:

```
150 NEXT A
160 NEXT B
```

and you'll get a next-without-a-for error (NF). You must include the B loop within the A loop for the program to run properly.

Here's a legal change: Delete line 160 and type in 150 NEXT B,A. This saves a line. You can create numerous nested loops, and if program logic calls for it, you can end them all at once in one statement: NEXT X,H,Jl,LZ.

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The listing below uses nested loops to produce a running clock. Variable HR represents hours, MN is minutes, SC is seconds, and T represents a timer of 1 to 300 for each second.

```
100 REM * CLOCK
110 CLS: FOR HR=0 TO 23
120 FOR MN=0 TO 59
130 FOR SC=0 TO 59
140 PRINT@40,HR": "MN": "SC;
  STRING$(5,32);
150 FOR T=1 TO 300
160 NEXT T,SC,MN,HR: END
```

To make the clock more accurate for your computer, experiment with line 150's For...Next time loop value, comparing the result against an actual timepiece. Note that Basic material interleaved in the program can slow such timer routines.

Use nested loops to read or otherwise set values in a multidimensional array:

```
100 REM * Array Setter
110 DATA 3,6,7,1,3,6,9,9
120 DIM A(2,2,2)
130 FOR X=1 TO 2: FOR Y=1 TO 2:
  FOR Z=1 TO 2
140 READ A(X,Y,Z): NEXT Z,Y,X: END
```

Run this listing, then try different values in line 120. For example, try A(2,1,2) or A(1,1,1). The results appear in line 110. Variables X, Y, and Z keep track of the variables. Using loops to read data values is a useful shortcut, especially when the program must read thousands of related array numbers.

If...Then Loops

Loops are of greatest value when used in an If...Then test. Insert the following line into the Clock listing:

```
145 IF H>7 THEN PRINT "Time to wake
  up!": END
```

The program might be more realistic if you rig a buzzer to sound when variable H attains a value of 8.

The following program is a pseudo-game that demonstrates how you can use a loop to determine an event.

```
100 REM * Whose Turn?
110 CLS: DIM A$(2)
120 A$(1)= "Sam": A$(2)= "Bob"
130 FOR X=1 TO 2
140 PRINT A$(X), "It's your turn."
150 INPUT "Type a guess and press
  enter";G
160 NEXT X: GOTO 130: END
```

Imaginatively using If...Then tests within loops will occur to you as you blend other Basic instructions into the concept. Here are some examples:

```
IF Z=12 THEN GOSUB 1000
IF MID$(A$,X,3)= "MIN" THEN PRINT
  "You guessed": END
IF C<100 THEN C=100
IF G/2=INT(G/2) THEN PRINT
  "Overload in sector ZED!"
```

Summing Up

A good working knowledge of loops can help you shorten your programs. Loops provide a convenient way to pause, count, set values, or search for values. They also test true/false situations and provide a handy tool for working with other Basic statements, commands, and functions.

Next month I'll discuss input/output functions and how information gets where it's going. ■

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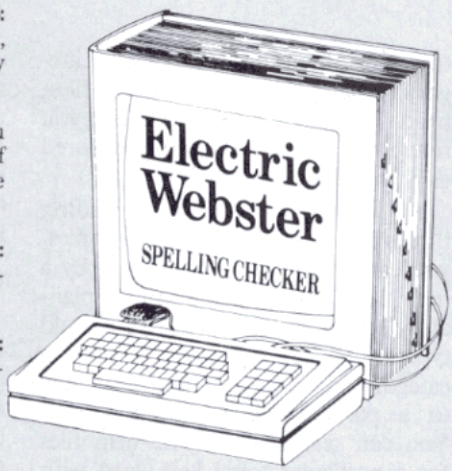

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Model 4 Owners Get Help

I think TRSDOS 6.2 is one of the best operating systems available for any personal computer. I've been using it for several months and have found little to complain about and much to praise.

TRSDOS 6.2's most powerful utility is Help/CMD. Unlike the Model III help function, the Model 4's version is completely expandable: You can add as many help files as you like to any disk you want. If you're developing a program for others to use, or if you'd like on-line lists of commands for your favorite utilities and applications programs, all you need do is write new help files. Help files all have the extension /HLP, but you don't have to type in the /HLP extension when entering the help file name.

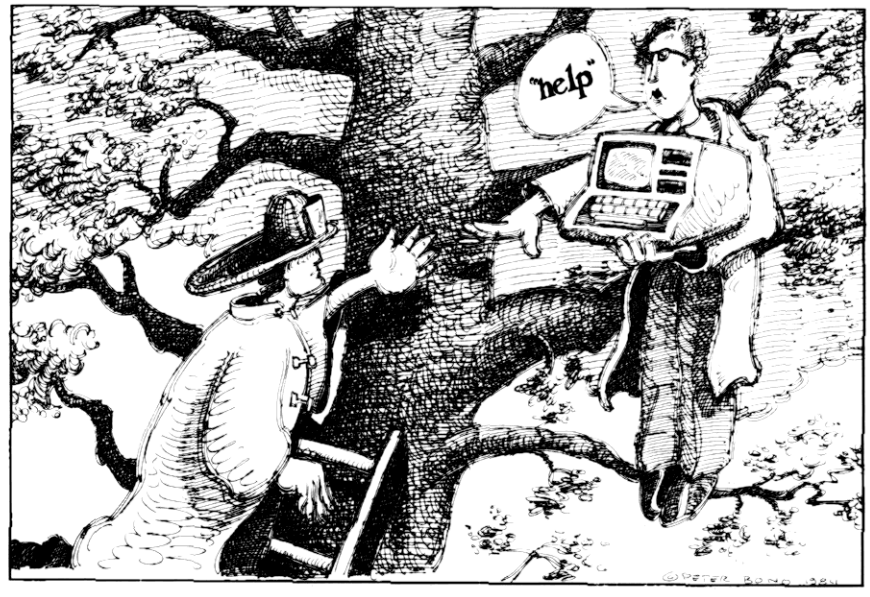

Illustration by Peter Bono

Of course, there's a catch. Neither Radio Shack nor Logical Systems Inc. (the authors of TRSDOS 6.X) have supplied any information about writing help files. To get you started, I'll describe the inner workings of Help, the format of a help file, and give you a Basic program that lets you write your own help files.

Help has several functions. If you type in HELP from TRSDOS Ready, you'll see a full screen listing the help files available. On a distribution disk, DOS is the only category that appears.

You have to follow a specific format in setting up a help file so the help utility can move through a set of disk files quickly.

If you type in the name of a help file, a list of topics appears that are actually subsections of the complete help file (records in the file). To see information about a topic, type in its name and press the enter key. For instance, say you've developed a help file for Scripsit. If you type in Scripsit/HLP, you'll see a list of topics for Deleting, Inserting, Block Moves, and so on.

Once you've looked over the help file, you can either press the enter key to return to the list of topics or type in the name of another topic in that category. When you're done with the files, press the break key to leave Help; you return to DOS with the screen restored as if you'd never used Help.

If you don't feel like wading through the list of help files or topics, you can type in HELP followed by a help file name to bypass the explanatory screen. Alternatively, you could type in HELP followed by both a category and a topic to move directly to a particular information screen. You can search all on-line help files for a particular topic key word with the command HELP *Topic, and you can also set parameters for printout and video display (explained in Help's main menu).

When you type in HELP from TRSDOS Ready, the program displays its opening page and searches all disks for files with the extension /HLP. Help removes the extension and drive number from the file name and displays the rest as a category title. Since DOS/HLP is the only help file on the distribution disk, it's the only category that Help normally lists.

If you have help files with the same name on different disks, Help displays each as a separate category. Add a drive suffix after a category name to tell Help to work with a file on a particular disk; otherwise, it picks the first it comes to in the same way Basic does.

Help File Structure

The directory entry for DOS/HLP is the first clue to the file structure of all help files. DOS/HLP has a logical record length of 1 (instead of the more common record length of 256). It treats a help file as a string of bytes instead of a series of records, and it finds its way through the file by knowing the address of the individual bytes it wants to read.

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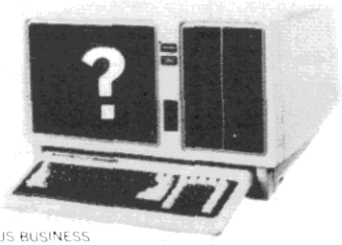

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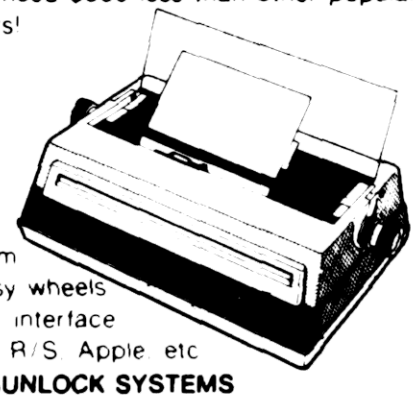

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Program Listing. Help file generator.

```
100 '            HELP File Generator
101 '            for TRSDOS 6.2
102 '            Written by Hardin Brothers
103 '
104 CLS
105 DEFINT A - Z
106 MAX.LINES = 100
107 MAX.TOPICS = 100
108 DIM A$(MAX.LINES), B$(MAX.TOPICS), C$(MAX.TOPICS)
109 BCOUNT = 0: PLACE = 0
110 '
111 '       Get a file name, massage it, and open file
112 '
113 INPUT "Name of Category (File Name)"; F$
114 '       Strip extension and drive #
115 IF INSTR(F$,"/") THEN F$ = LEFT$(F$, INSTR(F$,"/")-1)
116 IF INSTR(F$,":") THEN F$ = LEFT$(F$, INSTR(F$,":")-1)
117 '       Cut down to 8 characters
118 F$ = LEFT$(F$,8)
119 '
120 INPUT "Drive Number";D$
121 '       Is it legal?
122 IF LEN(D$)>1 OR D$>"7" OR D$<"0" THEN GOTO 120
123 '       Put together the file name
124 FILE.NAME$ = F$ + "/HLP:" + D$
125 '       Open the file and erase old copy if there is one
126 OPEN "R",1,FILE.NAME$,1
127     IF LOF(1) = 0 THEN GOTO 132
128     CLOSE 1
129     KILL FILE.NAME$
130 GOTO 126
131 '       Field the file
132 FIELD 1, 1 AS D$
133 '
134 '       Get a Topic Name and turn it into upper-case
135 '
136 CLS
137 BCOUNT = BCOUNT + 1
138 PRINT "Category ==> ";F$
139 PRINT "Topic #"; BCOUNT; "  ==> ";
140 LINE INPUT B$(BCOUNT)
141 IF LEN(B$(BCOUNT))>32 THEN GOTO 139
142 IF LEN(B$(BCOUNT)) < 2 THEN GOTO 139
143     FOR I = 1 TO LEN(B$(BCOUNT))
144         B.CHAR$ = MID$(B$(BCOUNT),I,1)
145         IF B.CHAR$ => "a" AND B.CHAR$ <= "z"
              THEN MID$(B$(BCOUNT),I,1) = CHR$( ASC(B.CHAR$)-32)
146     NEXT I
147 '       Put current file location into C$(BCOUNT)
148 C$(BCOUNT) = MKI$(PLACE)
149 ACOUNT = 0                  'Line counter
150 INV.OFF = -1                'Flag for inverse print
151 '
152 '       Now get the lines of text for this topic
153 '
154 CLS
155 PRINT "Category ==> ";F$
156 PRINT "Topic    ==> ";B$(BCOUNT)
157 PRINT: PRINT "Embed <\> to toggle inverse print"
158 PRINT "Enter line of <X> to end"
159 PRINT
160 '       Enter one line
161 ACOUNT = ACOUNT + 1         'Increase line counter
162    A$(ACOUNT) = "": PRINT "Line"; ACOUNT; "==> ";
163    LINE INPUT A$(ACOUNT)
164    IF A$(ACOUNT) = "X" THEN GOTO 170   'Leave when done
165 '       Change <\> characters to inverse toggles
166    IF INSTR(A$(ACOUNT),"\") THEN
       MID$(A$(ACOUNT),INSTR(A$(ACOUNT),"\"),1) = CHR$(127):
       INV.OFF = NOT INV.OFF:
       GOTO 166
167 '       Put a CR at the end of each line
168    A$(ACOUNT) = A$(ACOUNT) + CHR$(13): GOTO 161
169 '       If inverse print is still on, place toggle before CR
170 IF NOT INV.OFF THEN
    A$(ACOUNT-1)=LEFT$(A$(ACOUNT-1),LEN(A$(ACOUNT-1))-1)+CHR$(127)+CHR$(13)
171 A$(ACOUNT) = CHR$(12)                'Mark end of Topic
172 '
173 '       Put the text into the file
174 '
175 FOR I = 1 TO ACOUNT
176     FOR J = 1 TO LEN(A$(I))
177         LSET D$ = MID$(A$(I),J,1)
178         PUT 1,PLACE + 1
179         PLACE = PLACE + 1
180     NEXT J
181 NEXT I
182 '
183 '       Another topic?
184 '
185 CLS
186 PRINT "Another Topic?";
187 YN$ = INPUT$(1)
188 IF YN$ = "Y" OR YN$ = "y" THEN GOTO 136
189 IF YN$ <> "N" AND YN$ <> "n" THEN GOTO 187
190 '
191 '       No more Topics, so sort the list using a selection sort
192 '
193 CLS: PRINT "Sorting Topic Names"
194 IF BCOUNT <2 THEN GOTO 207       'Skip sort if less than 2 topics
```

Listing continued

Store your topic titles in uppercase and in alphabetical order.

Each help file has three sections: the text of all topics, a list of topic titles, and a pointer to the beginning of the title list. The order of the first two sections may be reversible, but building a file that way would be more difficult.

The file's final 2 bytes hold a pointer to the beginning of the topic title list. The file stores this pointer in binary form, in least significant byte/most significant byte (LSB/MSB) order. Help starts reading a help file by opening the file with a logical record length of 1 and then moving to the end of the file to read those 2 bytes. It then uses those bytes to position the file to the beginning of the topic list. Because of the structure of the final pointer as well as the other pointers in the file, the maximum length of any help file is 64K, including topic titles and address pointers.

The list of topic titles has several peculiarities. Each topic title must be at least 2 bytes long, though I know of no upper limit. However, Help only accepts 32 characters of input when it asks for a topic title, so use that as a practical limit.

Store the titles in uppercase, because Help translates your requested topic to uppercase before searching the list. Also, be sure to store the topic titles alphabetically. Help must use something akin to a binary search to find topic titles quickly; I know from experience that it can't find topics that aren't in alphabetical order, though it does include them in the topics list.

Each topic title must end with a byte that has the high bit set. For example, if the help file contains a topic named Test, you must store the final 'T' as D4 hexadecimal (hex) instead of the normal ASCII value of 54 hex. Help follows each topic name with a 2-byte pointer to the position of the beginning of its text section in the file.

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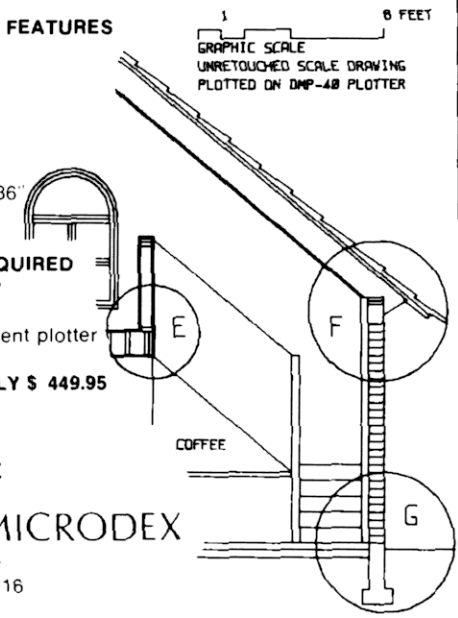

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Listing continued

```
195 FOR I = 1 TO BCOUNT
196     MIN$ = B$(I)
197     MIN.PTR = I
198     FOR J = I TO BCOUNT
199         IF B$(J) => MIN$ THEN GOTO 202
200         MIN$ = B$(J)
201         MIN.PTR = J
202     NEXT J
203     IF MIN.PTR = I THEN GOTO 206
204     SWAP B$(I), B$(MIN.PTR)
205     SWAP C$(I), C$(MIN.PTR)
206 NEXT I
207 '
208 '       Now load the topic names and addresses
209 '
210 C$ = MKI$(PLACE)          'Save current file location
211 PRINT "Saving Topic Names to Disk:"
212 PRINT
213 FOR I = 1 TO BCOUNT
214    PRINT B$(I)
215     B.CHAR$ = RIGHT$(B$(I),1)
216 '       Set high bit of last character
217     MID$(B$(I),LEN(B$(I)),1) = CHR$(ASC(B.CHAR$) OR 128)
218     FOR J = 1 TO LEN(B$(I))
219         LSET D$ = MID$(B$(I),J,1)
220         PUT 1, PLACE + 1
221         PLACE = PLACE + 1
222     NEXT J
223 '       Save address of Topic's text
224     FOR J = 1 TO 2
225         LSET D$ = MID$(C$(I),J,1)
226         PUT 1, PLACE + 1
227         PLACE = PLACE + 1
228    NEXT J
229 NEXT I
230 '
231 '       Save address of Topic list
232 '
233 FOR I = 1 TO 2
234     LSET D$ = MID$(C$,I,1)
235     PUT 1, PLACE + 1
236     PLACE = PLACE + 1
237 NEXT I
238 '
239 '       Close file and leave
240 '
241 CLOSE 1
242 END
```

End

The computer stores text for each topic in modified ASCII form. To keep the disk file as short as possible, you can omit spaces from the text. If the computer stores any character with the high bit set, Help will print the character normally and follow it with a space. However, it will also print normal ASCII spaces, so you don't need to use this trick to condense the file.

The character 7F hex tells Help to turn inverse printing either on or off. Inverse printing is automatically turned off when Help starts printing a section of text; the first 7F hex character turns it on, the next turns it off again.

Help stores carriage returns in the text portion as normal 0D hex bytes (the ASCII code for a carriage return). Each text section ends with a 0C hex byte, which is a signal to Help to stop printing the text and display its own prompt message.

When Help prints out the text for a topic, it follows specific formatting rules. First, it always puts the topic title at the top of the screen; you don't need to store the title again in the body of the text. Also, Help keeps track of the cursor position on the screen, and waits for your keystroke when the screen is full. The text does not need to have embedded marks for the end of each screen. The first screen holds the topic title plus 23 lines of text; each following screen holds 24.

Creating Help Files

After I deciphered the structure of a help file, writing a program to create new files was easy. I thought first of writing a program that would take an ASCII file from a word processor as input, but decided that it was easier in most applications to simply type the text directly into a Basic program.

The Program Listing shows one way you can write such a utility. With the information above and the comments in the program, you should have little trouble understanding what happens in the program. It uses a simple block structure for clarity, and demonstrates how to generate a help file. The only unusual part of the program is the way that you calculate positions in the file. Basic numbers the bytes in the file starting at 1, but Help starts counting at zero.

Though help files must have a cer-

You can create some unusual effects within the Help file format.

tain format, you can still create some unusual effects with them. For example, you may want to display a single page of information instead of a list of topics with several pages of text. You can create such a file by removing lines 141–181 and 193–205 from the Listing. Treat each topic as a screen line (make sure you enter a full line of information) and Help will think you've created a file with many topics and no text. When you type in HELP and a category from TRSDOS Ready, the single page of information appears on the screen.

Also, you could create a file in which several topics share the same text. You do so by altering the Listing; even easier would be to use a file editor (such as Super Utility Plus or the LDOS file editor, FEDII) to alter the pointers following topic names so that they point to the same sections of text in the disk file.

The power and flexibility of Help is only one example of the general excellence of TRSDOS 6.2. If you use a Model 4 or 4P and have not yet upgraded to TRSDOS 6.2, I urge you to do so. This new version of TRSDOS adds enough features to be well worth the upgrade price, and Radio Shack has removed most of the bugs of the earlier Model 4 TRSDOS. Help is the only new utility included with TRSDOS 6.2, but it alone is worth at least half the purchase price. ■

You can contact Hardin Brothers through CompuServe. Go PCS-117 to the Writers' and Editors' SIG (WESIG) and leave your message addressed to him. Feel free to join in discussions started by others.

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Basic Bonus: Redefined Function Keys

Last month's column focused on commercial software; this time around, I'll get into some Basic programming techniques. My program, KEYMOD.BAS, redefines the Tandy 2000's 12 function keys; you can use the program as written or substitute any Basic commands you choose.

Illustration by Charlie Wilton

Some Key Changes

Why redefine the function keys? First, Microsoft chose to assign the most useless Basic commands to them. You really don't have much need for the TRON (trace on) or TROFF (trace off) commands.

Also, the F1 key invokes the List command. This is fine if you want to list an entire program. However, when you want to list only a small segment of a program, you must remember to add a space between the key word and the part of the command specifying the program segment. Most of the time, I wind up with a syntax error because I forget the space.

Finally, the F11 and F12 keys aren't even assigned a command, so they're being wasted.

The Program Listing permanently assigns new definitions to the programmable function keys. Table 1 shows the Listing's new commands; you can choose any commands you want. I'll explain some of the code segments so you can apply the same techniques to other programs.

Lines 10–130 initialize the program and assign key definitions to the elements of array K$( ). Lines 140–250 prompt you to press the enter key after you insert a disk containing Basic.EXE in drive A.

Lines 260–310 perform the file-open operation. This seems more complex than usual, but the additional code is necessary. I want only Basic.EXE's last two records, so I must access the file using direct (random) access methods. However, if you attempt to open a file using the

Program Listing. KEYMOD.BAS.

```
10 DEFINT A-Z: DIM K$(12)
20 K$(1) = "LIST "
30 K$(2) = "RUN"+CHR$(13)
40 K$(3) = "LOAD"+CHR$(34)
50 K$(4) = "SAVE"+CHR$(34)
60 K$(5) = "LLIST "
70 K$(6) = "SYSTEM"+CHR$(13)
80 K$(7) = "FILES"+CHR$(34)+"*.BAS"
90 K$(8) = "EDIT "
100 K$(9) = "CLS"+CHR$(13)
110 K$(10) = "SCREEN 0,0,0"+CHR$(13)
120 K$(11) = "WIDTH 40"+CHR$(13)
130 K$(12) = "WIDTH 80"+CHR$(13)
140 CLS
150 PRINT "BASIC Function Key Modification"
160 PRINT "Written by: John B. Harrell, III"
170 PRINT
180 PRINT:BEEP
190 PRINT "Make sure the disk in drive A has the BASIC.EXE file"
200 PRINT "to be modified and then press <ENTER> when ready."
210 A$=""
220 WHILE A$=""
230 A$=INKEY$
240 WEND
250 IF ASC(A$)<>13 THEN 210
260 ON ERROR GOTO 700
270 OPEN "I",1,"A:BASIC.EXE"
280 CLOSE
290 ON ERROR GOTO 0
300 OPEN "R",1,"A:BASIC.EXE",256
310 FIELD 1, 128 AS R1$, 128 AS R2$
320 GET 1,202
330 R202.1$=R1$: R202.2$=R2$
340 ZA$=R202.1$: GOSUB 750: ZA$=R202.2$: GOSUB 750
350 GET 1
360 R203.1$=R1$: R203.2$=R2$
370 ZA$=R203.1$: GOSUB 750: ZA$=R203.2$: GOSUB 750
380 MID$(R202.2$,117,11)=STRING$(11,0)
390 MID$(R202.2$,117,11)=K$(1)
400 MID$(R203.1$,1,128)=STRING$(128,0)
410 FOR I=0 TO 7
420 MID$(R203.1$,5+I*16,16)=K$(I+2)
430 NEXT
440 MID$(R203.2$,1,48)=STRING$(48,0)
450 FOR I=0 TO 2
460 MID$(R203.2$,5+I*16,16)=K$(I+10)
```

Listing continued

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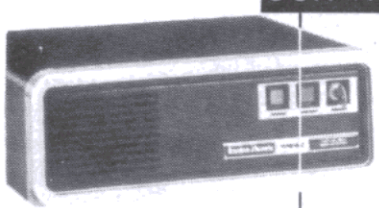

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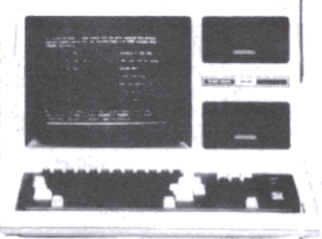

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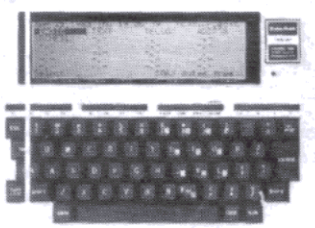

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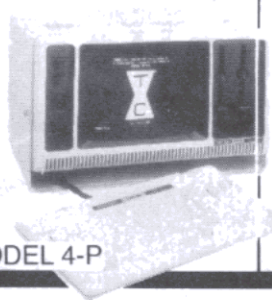

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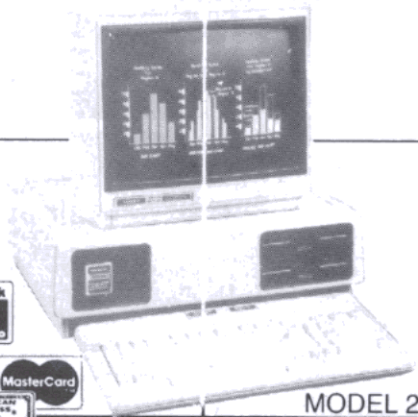

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Listing continued

```
470 NEXT
480 PRINT
490 PRINT "Record modification is complete - the modified records are:"
500 PRINT
510 ZA$=R202.1$: GOSUB 750: ZA$=R202.2$: GOSUB 750
520 ZA$=R203.1$: GOSUB 750: ZA$=R203.2$: GOSUB 750
530 PRINT
540 PRINT "Ready to permanently modify file BASIC.EXE with these
550 PRINT "new key definitions."
560 PRINT
570 PRINT "Is it 'OK' to update BASIC.EXE? ";
580 A$=""
590 WHILE A$=""
600 A$=INKEY$
610 WEND
620 IF A$<>"Y" AND A$<>"y" AND A$<>"N" AND A$<>"n" THEN 580
630 IF A$="N" OR A$="n" THEN STOP
640 LSET R1$=R202.1$: LSET R2$=R202.2$
650 PUT 1,202
660 LSET R1$=R203.1$: LSET R2$=R203.2$
670 PUT 1
680 CLOSE 1
690 END
700 PRINT
710 BEEP: BEEP: BEEP
720 PRINT "A:BASIC.EXE cannot be found on the current disk in drive A"
730 ON ERROR GOTO 0
740 RESUME 180
750 PRINT:FOR I=0 TO 7
760 A$=HEX$(I*16): IF LEN(A$)=2 THEN PRINT A$;": "; ELSE PRINT "0";A$;": ";
770 FOR J=0 TO 15
775 IF J=7 THEN PRINT " ";
780 A$=MID$(ZA$,I*16+J+1,1)
790 A$=HEX$(ASC(A$)): IF LEN(A$)=1 THEN A$="0"+A$
800 PRINT A$;" ";
810 NEXT
820 PRINT CHR$(179);
830 FOR J=0 TO 15
840 A$=MID$(ZA$,I*16+J+1,1)
850 IF ASC(A$) < 31 OR ASC(A$) > 127 THEN PRINT"."; ELSE PRINT A$;
860 NEXT
870 PRINT CHR$(179)
880 NEXT
890 RETURN
```

End

It's imperative to verify that the file exists before writing to it.

"R" option and the file doesn't exist, Basic creates a new file without indicating the previous file-open failure.

Any subsequent write operation extends this file. Therefore, it's imperative to verify that the file exists before writing to it. If you attempt to open the file using the I option and it's not there, Basic flags the failure as a file open error and lets you know.

Lines 320–370 retrieve records 202 and 203 from the file Basic.EXE and display their contents. These records contain the key definition table that you're modifying. The program stores these two records in the program as 128-byte segments even though I set the record length to 256 bytes. That's because Basic's ability to manipulate character strings is limited to 255 bytes. The subroutine that this segment calls (line 750) displays

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records in hexadecimal (hex) and ASCII format.

Program lines 380–470 modify the key assignments using the key strings assigned to the K$( )array. When the modification is complete, the program prompts you to initiate writing the modified records to the Basic. EXE file.

To use the program under the new Basic 1.03.00, load Basic and the Listing, then make the changes shown in Table 2. ■

Function Key	Original Assignment*	KEYMOD.BAS Assignment*
F1	[List]	[List]
F2	[Run<]	[Run<]
F3	[Load"]	[Load"]
F4	[Save"]	[Save"]
F5	[CONT<]	[LLIST]
F6	[,"LPT:"<]	[System<]
F7	[TRON<]	[Files"*.BAS]
F8	[TROFF<]	[Edit]
F9	[Key]	[CLS<]
F10	[Screen 0,0,0<]	[Screen 0,0,0<]
F11	[ ]	[Width 40<]
F12	[ ]	[Width 80<]

*Character strings are enclosed in [ ] symbols to allow including blanks and the " character in the assigned key text. The < character designates a carriage return.

Table 1. Standard and reassigned function key commands.

1. Delete lines 320–340
2. 350 GET **1,203**
3. Delete 380–390
4. 420 MID$(R203.1$,5 + I*16,16) = K$(I + **1**)
5. 440 MID$(R203.2$,1,**64**) = STRING$(**64**,0)
6. 450 FOR I = 0 TO **3**
7. 460 MID$(R203.2$,5 + I*16,16) = K$(I + **9**)
8. Delete 510
9. Delete 640–650
10. 670 PUT **1,203**

Table 2. Changes to the Listing for Basic 1.03.00. Boldface type indicates a change from the original listing.

John B. Harrell III is an associate editor of 80 Micro. *You can reach him at 1519-A Carswell Circle, Bolling Air Force Base, Washington, DC 20366.*

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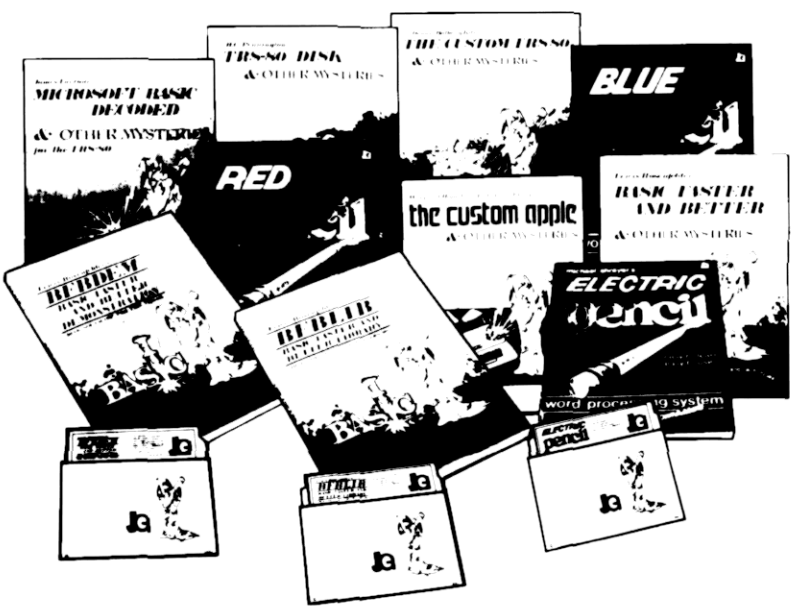

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Continued from p. 35

tion, the new documentation is written clearly and succinctly.

Aside from the much-improved BIOS, the first major change you'll note is the absence of the now-famous interchange utility (INTERCHG). As good as INTERCHG was, it had serious limitations (stepping your disk drives at 30 milliseconds, among other things). Montezuma replaced INTERCHG with a disk format definition file. You can use this custom disk formatter with either the configuration (CONFIG) or disk back-up (DUP) utilities to easily format disks.

CONFIG and DUP can access format definitions from the default disk or from any other drive or file you specify. With CONFIG, you can assign any of the four logical floppy disk drives to any of the formats defined in the definition file. You can make these changes (as all others) a temporary or permanent part of your system.

You write the disk formats in ASCII notation (using any text processor) so that they conform to the parameters prescribed in the CP/M disk parameter header and disk parameter blocks.

Montezuma Micro's CP/M now supports over 40 disk formats, including both 40- and 80-track drives, single and double density, and single and double sided, and, as the documentation says, you can "roll your own" formats. Montezuma also offers a formats-to-go service: If you send Montezuma a disk and the required format information, they'll return your disk with the updated disk definition on it.

The CONFIG utility provides the routine options that let you select various parameters for the keyboard, printer, serial port, and input/output device assignments. It also lets you assign any single byte value to the arrow, clear, and break keys in either unshifted, shifted, or control modes. And you can assign a string of up to eight characters to the three function keys in each of the same three modes.

In addition to the normal video control codes used in Montezuma's terminal emulation, CP/M provides 16 control codes not assigned a particular function. CONFIG lets you redefine these codes as duplicate functions of the 15 codes already provided. You don't have to change programs designed to work with another terminal emulation, all you do is redefine the control codes.

Montezuma's CP/M now supports over 40 disk formats, including 40- and 80-track drives and single- and double-density.

Another useful utility provided is KEYDEF. If you don't want to redefine keys with CONFIG, you can use KEYDEF. For example, WordStar requires several special control keys. With KEYDEF, you can reassign the arrow, clear, break, F1, F2, and F3 keys. These assignments remain in effect until you next cold-boot the system or until you run KEYDEF to return them to the default values. The input to KEYDEF is a simple ASCII text file you can develop with any text processor.

Hard Disk Drive Support

This is the first version of Montezuma Micro's CP/M that supports hard disk drives. It supports Radio Shack's 5-megabyte drive (catalog number 26-1130), Radio Shack's 15-megabyte drive (catalog number 26-4155), and Percom's 5-megabyte drive (part number PHD5C3). In addition to the drivers, you also get a patch to CP/M and a hard disk back-up utility.

The documentation first describes the organization of a hard disk drive. This section provides a lot of information, especially concerning one important feature of the system: Montezuma Micro's CP/M supports sharing the hard drive between CP/M and TRSDOS/LDOS. In fact, if you're creative, you can format a hard disk with all three operating systems co-resident.

The step-by-step instructions are easy to follow and use two of the other utilities Montezuma supplies, MOVCPM and SYSGEN. These programs create a larger resident area for CP/M to hold the hard disk driver, which needs an additional 1K of memory.

The hard disk driver contains the code necessary to format, partition, and assign the drives their proper logical names. If you set aside the first head of the hard disk as drive A, the Model 4/4P can boot directly from the hard disk once you finish the configuration process. The driver will format only the particular areas of the hard drive assigned to CP/M after positive confirmation of the order.

You use the HARDBACK utility to back up and restore hard disk drives from the floppy drives. The options available include backing up the hard disk, restoring the hard disk, or checking the hard disk for errors.

During a full back-up operation, HARDBACK compares the parameters for the hard drive and floppy disk you specify and tells you how many floppy disks you need to format. This is a nice touch. It's a real pain to be almost through backing up one of these drives only to find out you've depleted your supply of previously formatted disks.

HARDBACK also supports an archival back-up feature using the archive (or modified) attribute bit CP/M maintains. This saves you time when you've modified only a few files.

The last part of the hard disk support is CPMFIX. If you've never seen a 5 megabyte disk directory, imagine 792 files scrolling across your screen, four per line. This will rapidly try your patience.

CPMFIX implements standard features in the CP/M system used to solve this (and other) problems. To effectively use a hard disk drive, you must segment the logical drive into various user areas (numbered zero though 15).

This, however, creates a problem in determining the current user area, since CP/M normally doesn't display this information. And you can't easily access files in other user areas. Every user area would need its own copy of a utility.

CPMFIX patches the console command processor to allow a visual display of the user number with each command prompt. It also adds code to the system to allow those programs in user area zero to become available to all other areas. The last modification alters CP/M to honor the archive attribute bit.

Conclusion

I was pleased with this implementation of the CP/M system; it offers

some handy improvements over Montezuma Micro's previous version of CP/M. If you want to open your world to the vast software base available for CP/M, I think this version of CP/M is a fine way to do so. ■

Let There Be Music

by Gary A. Ludwick

Radio Shack has good news for all you closet Van Halens, Bachs, or Coplands: You can turn your Model III or 4 into a music synthesizer to create, load, play, edit, and save your own compositions. Orchestra-90 provides a complete hardware and software system that, when connected with your home stereo, turns your computer into an electronic orchestra.

If writing or transcribing music isn't your forte, there is a Special Interest Group (SIG) on CompuServ, Orch-90, that has hundreds of songs you can store and play back. All you have to do is download them. Whichever way you use it, Orchestra-90 is an excellent value at its price.

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★★★★½

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Easy to use?	★★★★☆
Good docs?	★★★★★
Bug free?	★★★★★
Does the job?	★★★★★

Overview

Orchestra-90's hardware comprises a two-channel stereo pre-amplifier that attaches to your computer's 50-pin input/output bus. The leads from the pre-amp go directly to the tape or auxiliary inputs of your stereo. The package includes the patch cords as well as a set of torroid coils to eliminate radio frequency interference. Installation is a snap, taking only about 10 minutes.

Orchestra-90 comes in two versions, one for straight cassette use and one for transferring the cassette programs to disk. I would rather that Radio Shack charge an extra $5 for a disk version, to avoid the hassle of wiring up a cassette to make the transfer.

The Orchestra-90 package includes a 74-page manual that is refreshingly well done. It makes the assumption that you know nothing about music or musical notation, and then leads you through song creation step by step.

Musical Basic

Remember your first attempt at Basic programming, how you sat there with the manual in your lap, trying to memorize syntax, functions, and error messages? If you recall that experience, creating and transcribing music on Orchestra-90 will seem familiar.

Using Orchestra-90 is really like learning a new programming language: It has its own syntax, symbols, and error codes (see Figs. 1 and 2). The program designers have created a new computer language that translates every aspect of musical notation into a form you can enter from your keyboard, without learning any music theory.

In Fig. 2, for example, you can see how every note on the bass and treble staffs has been assigned a number or letter code. If you were transcribing an existing piece of sheet music, all you'd have to know is the note's position on the staff and the Orchestra-90 code assigned to that position.

In addition, Orchestra-90's coding system accommodates other musical symbols: sharps, flats, syncopation, meter, articulation, measures, and repeats are all predefined. For further flexibility, you can produce harmonies in up to five voices (five notes played simultaneously) and you can assign one of five instrument sounds (trumpet, oboe, clarinet, organ, or violin) to the notes.

Making Orchestra-90 Work

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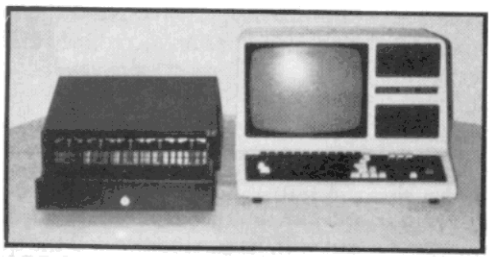

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Note Symbol	Musical Note Name
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+F	D
+E	C
+D	B
+C	A
+B	G
+A	F
+9	E
+8	D
+7	C
+6	B
+5	A
+4	G
+3	F
+2	E
+1	D
0	C (Middle C)
-1	B
-2	A
-3	G
-4	F
-5	E
-6	D
-7	C
-8	B
-9	A
-A	G
-B	F
-C	E
-D	D
-E	C
-F	B
$	REST

Figure 1. Orchestra-90 note conversion chart.

training often learn Orchestra-90 easier than people with a musical background. The reason is simple: All you have to remember is that a note at a particular place on the staff is zero. To me, that note is middle C, which I then have to translate to a programmed zero. Orchestra-90 codes all other notes relative to middle C's zero.

Programming in Orchestra-90 is just like programming in Basic: You have to follow certain rules. With a couple of weeks of practice, Orchestra-90 will become as second nature to you as Basic is to many people.

Unusual Program Support

Although Orchestra-90 is relatively new to Radio Shack, the program was previously available from Software Affairs (under the name Orchestra-80 and -85). For the beginner, this is good news, because on-line help is available through the Orch-90 Special Interest Group on CompuServe.

I mentioned earlier that Orchestra-90 could store and play songs. The Orch-90 SIG offers nearly 400 already programmed titles ready for downloading. Also, a number of other boards around the country feature music downloads for the program.

Best of all, you'll have access to experts who have been working with this system for some time, including the program's author. My inquiries on the SIG always resulted in quick and knowledgeable replies, and the download menu has an incredible variety.

Conclusion

Orchestra-90 in an intriguing piece of work.

Compared to other music systems on the market, Orchestra-90 stands out with its capabilities and the quality of its output. It does require you to do some work and to practice to become truly proficient with it, but so does Basic or learning the guitar. If you have a yen to try your hand at playing or composing music, Orchestra-90 is a good introduction. ■

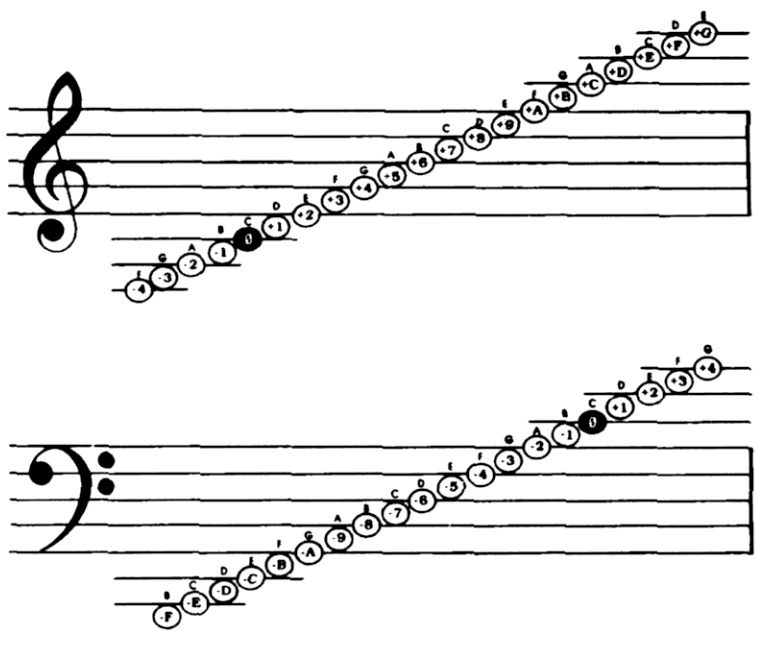

Figure 2. Orchestra-90 music language scale. The small letters above the notes represent the musical scale.

Spell Bound

by Terry Kepner

Model 4 owners plagued by typos and neologisms, take heart. Cornucopia Software has introduced Electric Webster, their well-known spelling checker program, for the Model 4 under TRSDOS 6.1 or Model 4 DOSPLUS. Electric Webster provides a fast, efficient way to check and correct spelling errors in text files.

This new version of Electric Webster features special modules that customize its operation for use with the Allwrite, Lazy Writer, LeScript, and Scripsit word processors. These modules let you invoke the spelling checker from within your word processor and then return to the text after Electric Webster checks the document. The modules also make allowances for the special formatting commands in each of the word processors so that these commands aren't included in the word counts given during the checking process.

Unfortunately, these special modules don't allow Electric Webster to check the word processor's formatting commands for errors. For example, Allwrite uses a semicolon at the beginning of a line to indicate a formatting control command. When Electric Webster encounters the semicolon, it skips the rest of the line. Any spelling errors in the commands remain undetected. Since Cornucopia programmed the modules so they don't count format commands as words, the manufacturer could additionally have had

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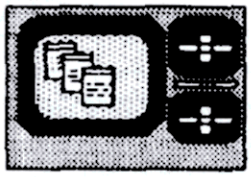

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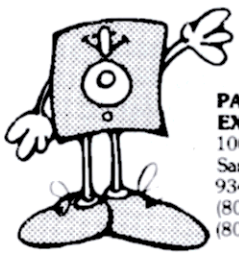

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Electric Webster provides that extra security you need when producing important documents, and it does so with a minimum of hassle.

the modules check command syntax and point out errors.

All Together Now

When you get Electric Webster, you should make a back-up copy using either TRSDOS or DOSPLUS. Cornucopia includes a special utility with Electric Webster, Test/EW, to detect file errors on the disk. If any files are bad, you should return the master disk to Cornucopia for replacement.

You need two disks to use Electric Webster: one for your word processor and Electric Webster's control files, and the other for the dictionary files.

With the back-up disk in your computer, transfer the six main sections of Electric Webster (using the appropriate word processor linking module) to your word processing disk. This requires about 70K of free space before you start. If you don't have that much room available, you can put two of the files on the dictionary disk instead (reducing available room for your expansion dictionary).

Now, format a new disk and put the dictionary files on it. That's all there is to it.

Working from Within and Without

You can invoke Electric Webster either from within your word processor or independently. If you call it from within, Electric Webster loads your document in memory, discards duplicate words, sorts the remainder, and compares them with the entries in its dictionary files. It eliminates matches and lists the other words to the screen in a group. Pressing the enter key starts the correction mode, where you can correct the word, leave it unchanged, display the word in context, display the appropriate section of the dictionary, add the word to the dictionary, or exit the program.

Selecting the in-context option reserves the word for later, when Electric Webster reloads the text file and displays the word in context. When you're done, Electric Webster updates the dictionary if necessary and returns you to the word processor with the corrected text in memory. (Allwrite and LeScript also put corrected copies on disk, Lazy Writer and Scripsit don't.)

Using Electric Webster by itself is quite different. It loads the document you specify in memory, discards duplicate words, and sorts and compares the remainder with the dictionary lists. Electric Webster displays words missing from the dictionaries on the screen, or sends them to your printer, and the program terminates operation.

The amount of memory available on your data disk is the only limit to the number of words you can add to Electric Webster's dictionary. On the dictionary disk, you have about 70K (after removing unnecessary Electric Webster files) if you're using standard 40-track, 18-sector Radio Shack drives.

Famous Last Words

Electric Webster provides that extra security you need when producing important documents, and it does so with a minimum of hassle. Its best features are available only if you integrate it with one of the word processors it supports.

The only serious drawback I found with Electric Webster is that it ignores the text formatting commands, forcing you to manually check them for spelling problems. ■

Electric Webster

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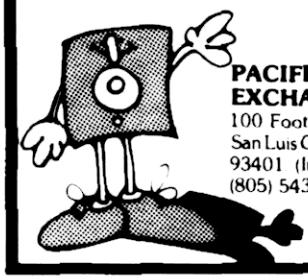

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11388945                                AA      AAF A  F  AA FF
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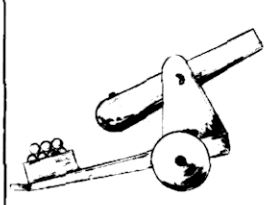

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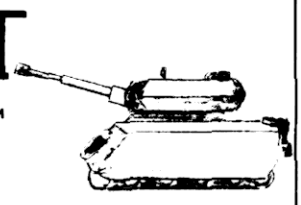

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At Home or Offix

Offix is an integrated software package for the Model 2000 that combines filing, word processing, forms design, and report generation in an easy-to-understand format.

Created by Emerging Technology Consultants Inc., Offix ($149) does away with user's manuals, featuring instead pop-up menus, help screens, and on-line tutorials.

Offix simulates the steps involved in gathering and filing information by displaying a file cabinet on screen. To open a file, you position the cursor over the appropriate drawer. Each drawer holds up to 100 file folders, and each folder can contain an unlimited number of documents.

More information is available from your local Radio Shack store, or by contacting Emerging Technology at 1877 Broadway, Boulder, CO 80302, 800-782-4896.

Reader Service ✓552

Data Adventures

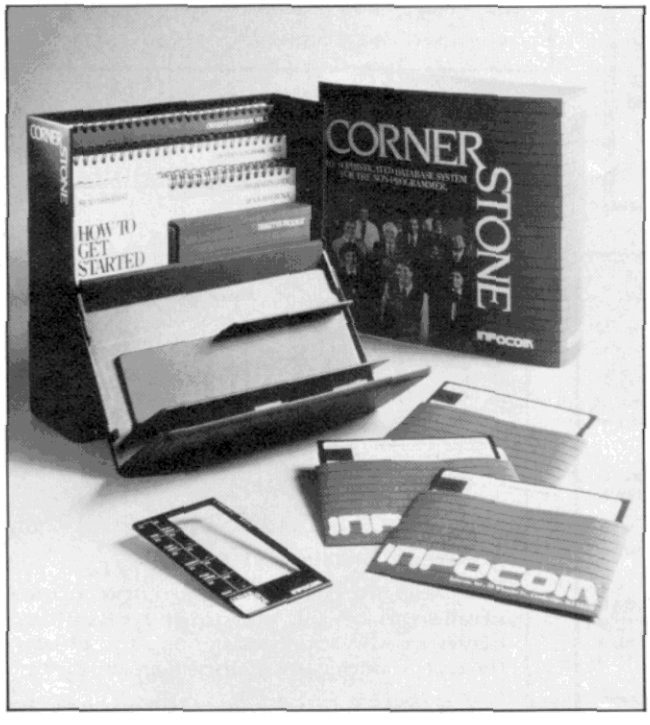
Infocom, maker of popular adventure games such as Zork and Deadline, is entering the business software market with Cornerstone ($495), a relational data base system for nontechnical users.

Program features include context-sensitive on-line help messages, menu-driven command structures, text editing capabilities, and a report writing module that draws information from any combination of files.

A conversion utility lets you transfer files from dBase II and III and PFS: file. Cornerstone includes an on-line tutorial, beginner's guide, owner's handbook, and sample data base application. The program is available for the Models 1000, 1200, and 2000.

Contact Infocom Inc. (55 Wheeler St., Cambridge, MA 02138, 617-492-1031) for more information.

Reader Service ✓ 574



The latest product from Infocom isn't a game—it's a data base manager for computer novices.

Diet Software

Soft Byte Inc. (Box 1484, E. Lansing, MI 48823, 517-337-1253) offers three nutrition software packages for the Models III and 4.

Heartware ($50) aids family cooks in making recipe changes for low-sodium, low-cholesterol, and low-fat diets. The program translates diet restrictions into healthy, appetizing meals by checking recipes for unacceptable ingredients. It then suggests substitute ingredients and calculates the necessary amounts.

The Balancing Act ($65) is an interactive dietary program for creating a weight loss plan. The program applies the basic concepts of weight control by balancing diet and exercise. Diet ratings let you balance or rebalance your diet.

A professional version of the program, The Balancing Act I ($299), is a multiuser, modifiable data base program for educating patients in weight control. It's designed for health professionals in private practice, outpatient clinics, and fitness programs.

Reader Service ✓ 557.

Tandem Tandy

Double Duty lets you run two programs simultaneously on a 128K Model 4. You can move between any two programs and execute library commands from within them.

The program partitions Model 4 memory into two 64K sections and a library command section, letting you concurrently run two programs that use less than 64K of memory each.

Created by Software Concepts Inc., Double Duty is available at Radio Shack stores (catalog number 26-2231) for $69.95.

For more details, contact Tandy Corp./Radio Shack at 1800 One Tandy Center, Fort Worth, TX 76102.

Reader Service ✓ 551

Thinking to the Max

MaxThink ($59.95) is a thought processor for Xenix, CP/M, and MS-DOS computers that helps you create outlines and organize ideas.

MaxThink helps you transform information into ideas by using commands for organizing, analyzing,

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For more information, contact MaxThink Inc., 230 Crocker Ave., Piedmont, CA 94610, 415-428-0104.

Reader Service ✓ 568

The PICDisk micro disk system includes CP/M 2.2 and T/Maker integrated software.

More CP/M

The PICDisk micro disk ($799) puts CP/M 2.2 on the Model 100, letting you run thousands of CP/M applications programs on your laptop (and your desktop) computer.

The system includes T/Maker, the integrated software package that incorporates spreadsheet, data base, word processing, list processing, and graphics functions.

PICDisk uses 3½-inch disks and provides an additional 32K of RAM. It attaches directly to the Model 100, requiring only a screwdriver for installation. A built-in battery pack and charger provide 2½ hours of disk access time.

A dual drive option is also available. For more information, contact Personal Integrated Computers at 18013 SkyPark Circle, Suite D, Irvine, CA 92714, 714-261-0503.

Reader Service ✓ 559

Connect the D.O.T.S.

The D.O.T.S. utility package ($29.95) lets you create, edit, and print designs on a dot-matrix printer using the Model I or III.

The programs, from MicroSmith Computer Technology (Box 1472, Elkhart, IN 46515, 219-293-8339) use an overlay that you put over the design you're digitizing. The enlarged grid on the overlay is proportional to the dot spacing on Epson and compatible printers. You can then modify any graphics block of 8 by 8 dots with the video graphics editor.

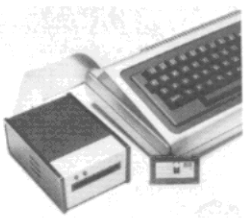
D.O.T.S. creates a data file for use with the print routines and includes routines to print designs on labels or as a logo on standard printer paper.

Two other Model I/III programs, Screen-It ($24.95) and Microcomm ($24.95), are available from MicroSmith. Screen-It saves printout paper by letting you display Scripsit files as they will print out.

The Microcomm communications program transfers CMD files, up- and downloads programs, and saves information to a buff-

Circle 166 on Reader Service card.

AFFORDABLE MASS STORAGE



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Model I ESF STARTER KIT **$149.50**
Add $6.50 Shiping, Includes: Drive 0, Manual, Operating System, Power Supply, Cable, Data I/O Tape, 5 Microwafers

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U.P.S. shipping cost, add $3.00, unless other specified
CA residents add 6.5% sales tax Charge to my ☐ VISA ☐ MASTERCARD

Prices subject to change without notice

Circle 148 on Reader Service card.

POWER HUNGRY?

Inside your TRS-80 Model 4 is immense POWER fighting to get out. SUPERMOD4 frees it!

YOU CAN COMMAND THE POWER

If you own a Model 4, and use a Model 3 DOS, you can now command a **SUPERCOMPUTER.**

SUPERMOD4 BRINGS POWER TO YOUR VIDEO with 80x24, 40x24, 64x16 and 32x16 video formats, reverse video, up to 24 line scroll protect and more. And this is *total power*: all BASIC video control commands (print@, tab, set, reset, point etc.) get the power.
SUPERMOD4 BRINGS POWER TO YOUR KEYBOARD, the power of an audible keyclick for accurate typing, the power of easily programmable special function keys.
SUPERMOD4 BRINGS POWER TO YOUR PRINTER. With its 14K print spooler, you can print while your computer does something else. You can also send unaltered graphics codes to your printer.
SUPERMOD4 BRINGS YOU THE POWER OF SPEED. Using the 4 MHz CPU clock, *all* your software runs twice as fast — but not out of control; SUPERMOD4 makes the realtime clock and similar operations work correctly.
SUPERMOD4 HAS THE POWER OF INVISIBILITY. SUPERMOD4 is 100% software, but all you see is the power, not the program; SUPERMOD4 uses NO USER MEMORY! *All* the powers touch not one byte of your memory.
SUPERMOD4 HAS THE POWER OF INTELLIGENCE, it knows how to do its job, it doesn't need any software or hardware patches. All SUPERMOD4 needs is a Model 4 (4P owners, please inquire) running most Model 3 DOS's. It works with all software that use the normal I/O drivers.

You control the POWER: select the ones you want, and have them work your way.

SUPERMOD4 is so powerful, only a few of its abilities have been revealed here.
To learn more, send for details.

What is the price of power? Only $49.95

DISK DRIVE — $49.95

Not a normal disk drive - but better! (And it doesn't even need diskettes!)

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- **SUPERDISK** allows extra memory to be used as a disk drive.
- **SUPERDISK** is 1000%-2000% faster than a normal drive.
- **SUPERDISK** works with all disk commands: format, copy, pdrive etc.
- **SUPERDISK** provides up to 106K of storage on a 128K Model 4 (less on 48K and 64K machines).
- **SUPERDISK** can be the system drive. No need to keep a disk in drive 0.
- **SUPERDISK** is compatible with Alpha Technology's memory boards. With them, create even larger RAMDISKS.

Also available: Hardware by Alpha Technology - 5 MHz CPU speed-up kits and memory expansion boards (up to 512K). Both are compatible with SUPERMOD4 and SUPERDISK. Send for details.

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er. It requires 48K RAM and a printer.

Reader Service ✓ 561

Pick a Daisy

Xerox Corp.'s Diablo Advantage D25 25 cps heavy-duty daisy-wheel printer ($745) uses an all-purpose interface to connect to serial or parallel interfaces.

The D25 features automatic proportional spacing, automatic carriage return, bidirectional printing, variable line and column spacing, and automatic paper loading.

Options include a bidirectional tractor and a single-bin sheet feeder. Hardware and software for these accessories is built into the printer.

For more information, contact Xerox Corp., Xerox Square 006, Rochester, NY 14644, 716-423-5078.

Reader Service ✓ 567

The Diablo Advantage D25 printer features an all-purpose interface that connects via a parallel or serial port.

Beeping in Basic

Logical Systems Inc. (8970 N. 55th St., Box 23956, Milwaukee, WI 53223, 414-355-5454) offers the BEEP enhancement package ($49) for TRSDOS 6.2 Basic.

BEEP provides one-keystroke abbreviations for the Auto, Edit, Delete, and List commands. The Immediate command key feature lets you use combinations of the arrow, period, and comma keys to edit the current line or to list the current line, the next program line, the previous line, the first program line, or the last program line.

Other features include moving a program line, duplicating a program line, and high-speed loading and saving. BEEP loads a 26K program in fewer than six seconds, compared to 26 seconds for TRSDOS 6.2 Basic.

Reader Service ✓ 554

Express Impressions

The TTXpress 1280 40-character-per-second (cps) compact thermal printer ($229) runs on batteries or ac current and fits into a briefcase.

The unit measures 11¼ by 4½ by 1¾ inches, weighs 2.2 lbs., and runs for up to two hours on three C

Circle 214 on Reader Service card.

Circle 260 on Reader Service card.

DISaDATa Now For The Model 4! The Only Disassembler That Even Tracks Down DATA!!!

• Outputs:

```
"H1929   DEFM   'READY'
         DEFB   ODH     "
```

instead of the meaningless "equivalent":

```
"AB25    LD     D,D
         LD     B,L
         LD     B,C
         LD     B,H
         LD     E,H
         DEC    C     ", etc.
```

• AUTOMATICALLY identifies such data areas.
• Outputs fully-labeled Radio Shack* or APPARAT** EDTASM* source code to display, printer, disk (and cassette -- Models I/III only).
• Can relocate itself to any free RAM area.
• Loads programs from disk (or cassette -- Models I/III only) and displays entry point.
• For TRS-80 Model I (Level II), Model III, or Model 4 (in Model III mode or under TRSDOS 6.0, in Model 4 mode).

#1354-42 (Model 4 diskette, TRSDOS* 6.0)..... $49.95
#1354-22 (Model III/4 diskette, TRSDOS* 1.3)..... $39.95
#1354-12 (Model I/III cassette)..... $36.95

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** Registered Trademark, APPARAT, Inc.

U.S. Funds Only. Add $2.00 shipping (U.S. & Canada), $5.00 (overseas air) per item. Ohio residents please add 6% sales tax.

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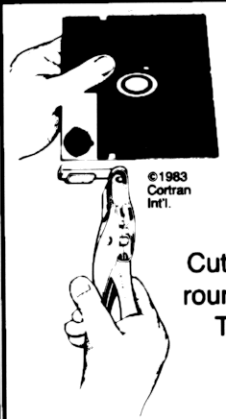

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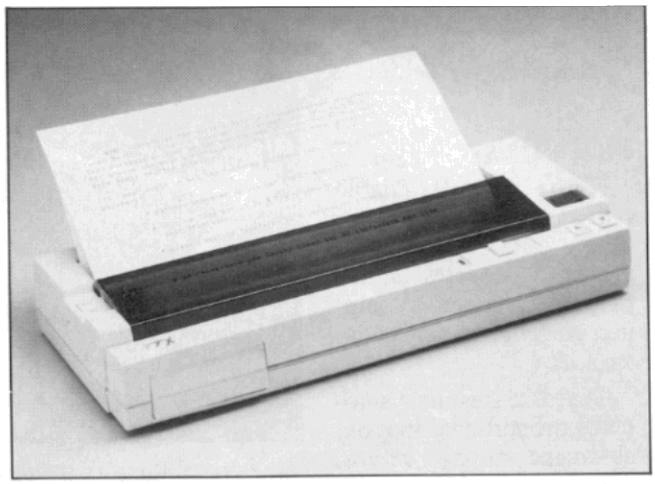


The TTXpress 40 cps battery-powered thermal printer fits into a briefcase.

batteries. Using an ac adapter (not included) increases print speed to 50 cps. TTXpress prints up to 160 columns on roll paper or 8½- by 11-inch sheets.

Other features include an internal buffer, bit-map graphics capability, and condensed, emphasized, and enlarged character modes. A parallel interface is included.

Contact TTX Inc., 3420 E. Third Ave., Foster City, CA 94404, 415-341-1300 for more information.

Reader Service ✓ 573

Ahead in the Polls

Survey Analyst, from The Alternate Source (704 N. Pennsylvania, Lansing, MI 48906, 517-482-8270) calculates results for your survey, questionaire, or poll.

The program lets you create a survey of up to 510 questions with yes/no, multiple-choice, and numerical answers. The data entry mode screens entries for accuracy, and edits, displays, prints, and saves files to disk. Output is in table format for presentation in reports.

Survey Analyst also profiles and compares selected respondent groups. The program is $195 and requires a Model I, III, or 4 with 48K RAM and two drives. A manual with examples and an overview of survey research is included.

Reader Service ✓ 570

Quick Switch

The Scooter Multi-Buffer ($389) automatically accepts data from up to three computers for output to one printer. Data from the computers waits in turn in Multi-Buffer's 64K memory before printing out.

An LED bar graph indicates the amount of buffer memory in use. Multi-Buffer also features LED lights that indicate which computers are inputting data, a print light, a pause switch, a copy switch for reprinting a data segment, and a reset switch. The unit works with any parallel printer.

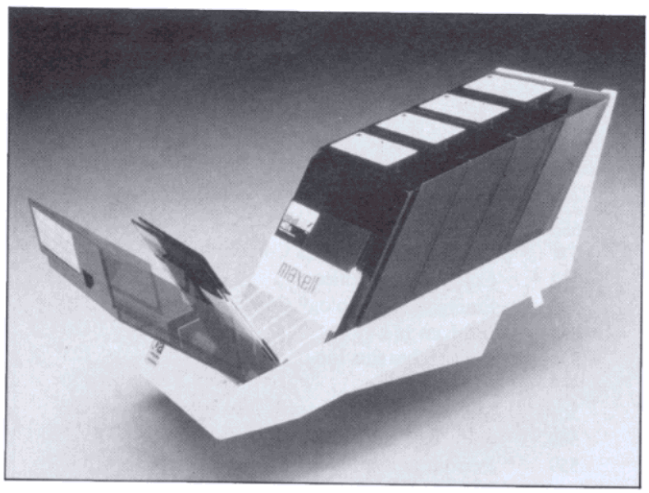
For more information, contact Ohm Electronics, 746 Vermont, Palatine, IL 60067, 312-359-6040.

Reader Service ✓ 569

Slim Screen

The Thinview LCD screen ($699) from Axonix Corp. is a self-contained 80-column by 25-line display system for the Model 100.

The expanded screen lets you edit full text pages, interpret spreadsheet data, and create high density



Disk Filer holds up to 50 disks in five transparent compartments.

graphics for output to a printer.

Thinview features an on-board microprocessor, a 16K RAM input buffer, a printer port, and a macro library of screen commands. The unit weighs 3 pounds and measures 11 by 6 by 1 inches. It includes a rechargeable power supply.

An optional operating system-based program lets you display Model 100 ROM-based programs on Thinview.

For more details, contact Axonix Corp. at 417 Wakara Way, Salt Lake City, UT 84108, 801-582-9271.

Reader Service ✓ 553

Introducing Disk Windows

Disk Filer ($34.95) organizes and protects up to 50 disks in five transparent, flip-down compartments. Color-coded labels identify each ten-disk compartment. A side lock secures compartments when closed.

Disk Filer includes a handle and measures 14 by 6¼ by 8 inches.

Thinview adds a 25-line LCD screen to the Model 100.

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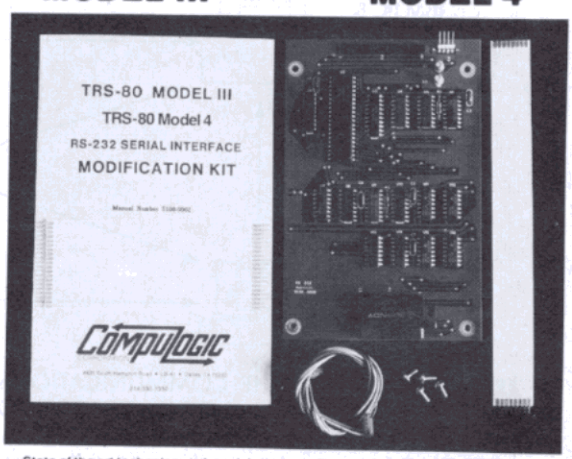
THE RS-232

MODEL III MODEL 4



State of the art technology in board design, our direct replacement of Radio Shack's* internal RS-232 board, mounts inside the Model III or 4 on the existing brackets. All cables, screws and complete mounting instructions are included. Non-technical people will find that installation is quick, straight forward and simple requiring less than 15 minutes to complete.

Total compatability with Radio Shack* and all existing software is maintained. Software programmable baud rates from 50 to 19,200 baud are supported along with programmable word length, stop bits, and parity. May be utilized in either half of full duplex operation.

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For more information, contact Computer Accessories Corp. at 7696 Formula Place, San Diego, CA 92121, 619-695-3773.

Reader Service ✓ 571

Programs Plus

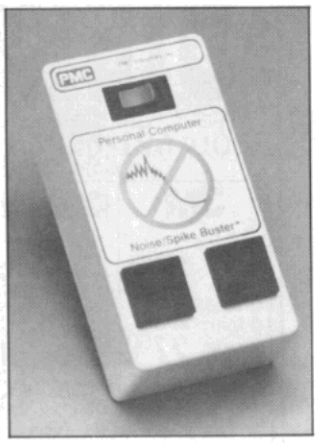
In *60 Business Applications Programs for the TRS-80 Model 100 Computer*, Terry Kepner and Mark Robinson offer a range of useful business programs for the Model 100.

A full explanation accompanies each program, and a glossary of commonly used business terms is included. The book is $17.95 from Scott, Foresman and Co., 1900 E. Lake Ave., Glenview, IL 60025.

Reader Service ✓ 555

Spike Busters

The Model 062 two-outlet Noise/Surge Buster ($79.95) for personal computers protects data from line noise, transients, and high-voltage surges.



The Surge Buster comes in two- and four-outlet models.

A four-outlet model is also available. Contact PMC Industries Inc. (9353 Activity Road, San Diego, CA 92126, 619-695-3520) for more details.

Reader Service ✓ 566

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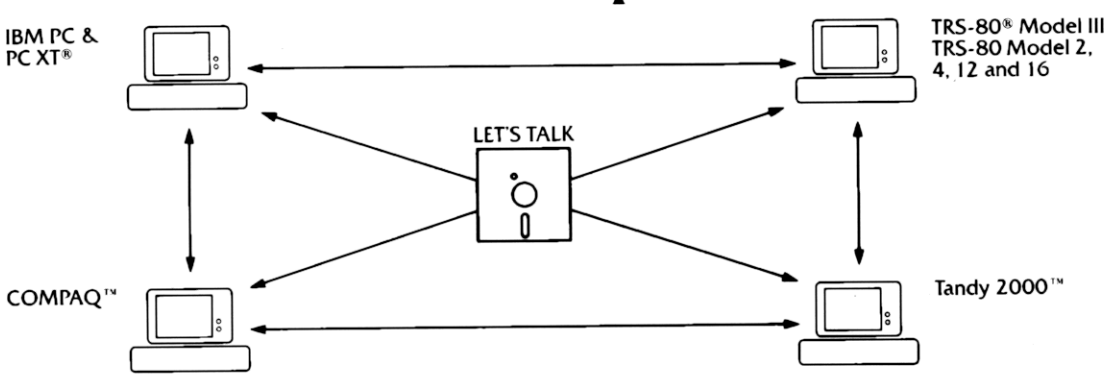
New Products listings are based on information supplied in manufacturers' press releases. 80 Micro *has not tested or reviewed these products and cannot guarantee any claims.*

Circle 496 on Reader Service card.

Communications Gap? LET'S TALK™!



LET'S TALK CLOSES THE COMMUNICATIONS GAP BETWEEN TODAY'S POPULAR PERSONAL COMPUTERS.

LET'S TALK is a complete package for fully supported communications between any of these computers. In any direction. Without additional expense.

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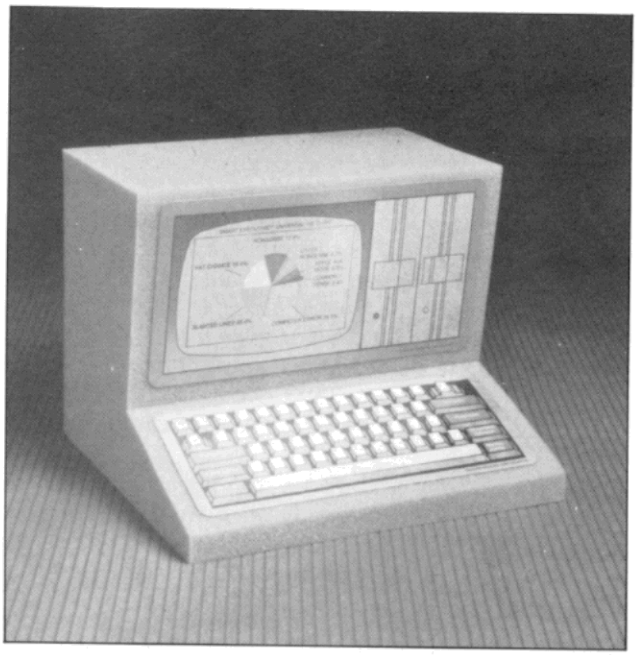
LET'S TALK includes all diskettes for each of the above computers. Suggested retail price $179.00 + $5.00 shipping

DIFFERENT TRACK



The Kickable Computer lets you abuse your computer without losing data.

Computer Kicks

Frustrated computer owners take heart! Computer Novelties offers a computer you can kick, stomp, or throw against a wall without losing valuable data.

The Kickable Computer ($9.95 plus $2 shipping) is made of foam rubber-like material to take whatever punishment you inflict. The computer's monitor features the Universal Pie Chart—it applies to all data, eliminating the need for costly graphics software.

In addition, the Kickable Computer features the no-touch keyboard and the Groundless Optimism key for important business plans.

The computer includes a complete operations manual, "disk drives," plus a sample stick-on upgrade kit that lets you install up to 640 "K." Options include a foam antenna (for pulling in hard-to-get programs), a memory upgrade kit, and a repair tool (for hardware and software).

For more information, contact Computer Novelties at 1600 Downs Drive, Suite 4, W. Chicago, Il 60185, 312-231-8420.

Reader Service ✓ 562

Circle 164 on Reader Service card.

TRS-80®

TRS-80 Radio Shack Computers

TRS-80 4P 2 Disk Drive 64K	$975.00
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TANDY CM-1 Color Monitor	$575.00
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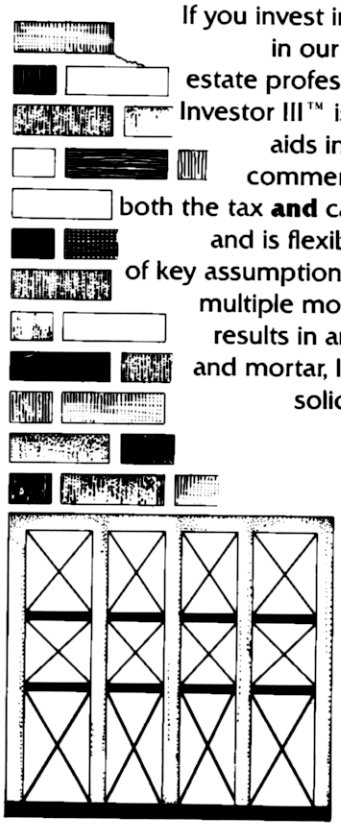
BRICKWARE



If you invest in brick and mortar, then you should invest in our brickware, Investor III™. Designed by real estate professionals to work on the IBM PC or TRS-80, Investor III™ is a comprehensive software package that aids in investment analysis of property, whether commercial or residential, small or large. It shows both the tax **and** cash aspects of an investment opportunity and is flexible enough to allow you to vary a number of key assumptions (such as cash flow, phased investments, multiple mortgages, and tax parameters) and see the results in an instant. So if you are serious about brick and mortar, look at our brickware. It will help you lay a solid foundation for your investment strategy. Contact your local dealer.

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Tandy: MS-DOS Means More Than "Me Too"

Send your questions about Tandy products and services to Ask Tandy, 80 Micro, *80 Pine St., Peterborough, NH 03458.*

Q: Does Tandy's introduction of a family of MS-DOS computers mean you'll be cloning IBM's every move?

A: *No. When we introduced our first MS-DOS computer, the Tandy 2000, it was the highest performance MS-DOS machine available (IBM finally has a Tandy 2000 competitor, the PC AT). The Tandy 1000 has a high level of software compatibility with the IBM PC, but it's not a clone. It couples PC functionality with enhanced graphics and sound at an unheard-of price. Our goal is products that take advantage of the huge MS-DOS software base, yet that go beyond a "me too" approach.*

Q: Despite references in the Model 4 owner's manual to TRSDOS support of double-sided drives, I was unable to get any answers from Fort Worth about how to use them. Why?

A: *LDOS has support built in for double-sided drives, even drives of different sizes, as we recall. Radio Shack has never intended to support those capabilities, but neither did we remove them. Logical Systems, authors of LDOS, can supply information on some of those feature we don't support.*

Q: I work in a school system, teaching computer education on a limited budget. I've read that you give 100 hours of training to your sales people. Could I get or use some of that material for my classroom work?

A: *The training material we use is sales-oriented, and wouldn't be of much use in a classroom environment. Our training isn't all classroom work either; part of it is on-the-job training administered by field management people. Sorry, but we don't think it would fit your needs.*

Q: I hear that a company other than Tandy manufactures the new Tandy 1200 HD. Does the same company make the Tandy 1000?

A: *The Tandy 1000 is a new design by Tandy engineers, and is built at a Tandy factory in Fort Worth, TX.*

Q: Now that Tandy's line of business computers includes the 1000 and 1200 HD, do you plan to continue fully supporting the Model II/12/16 line?

A: *The II/12/16 family provides a great expansion path from a highly functional 8-bit computer to a multiuser 16-bit system. We don't plan to support multiuser operation of the 1000 or 1200 HD, nor will we abandon the II/12/16 family.*

Q: So far, Tandy has introduced high-end, mid-range, and consumer-priced MS-DOS computers. Any plans for a fourth MS-DOS computer priced under $1,000?

A: *No.*

Q: Will Tandy offer any trade-in arrangements to Model I/III/4 owners who want to buy a Tandy 1000?

A: *Radio Shack stores aren't prepared to handle used hardware, and have never offered trade-ins. We have no plans to change that policy.*

Q: I'm considering replacing my Model III with a Tandy 1000. Can I access some of my Model III ASCII files with the Tandy 1000, maybe via cassette?

A: *The Tandy 1000 has no cassette facility. However, ASCII files are ASCII files. You could transfer them via the RS-232 port with communications software. You could probably use text files, but data files would be of questionable value, unless the same program is available under MS-DOS. But it's not guaranteed they'll work. Commercial programs to convert from TRSDOS to MS-DOS format are available; look for ads in* 80 Micro.

Q: Does Tandy really answer the Ask Tandy questions? Are Tandy/*80 Micro* relations that good? If so, why isn't Ed Juge writing his Inside 80 column again?

A: *Yep, it's really Tandy. Relations between Tandy and all of our support publications are excellent. Relations with* 80 Micro *have never been better. Ed would probably do Inside 80 again, but the editors apparently feel Ask Tandy is more useful to readers.*

Q: I have a new 128K Model 4. Why does the PRINTMEM command produce a figure of 29,924 (or less) instead of a number nearer 128,000?

A: *An 8-bit computer can count only as high as 64K, so the use of more than 64K of RAM requires switching between banks of memory. The memory management needed to bank switch from Basic would cut your computer's operating speed by at least half, and would add substantially to Basic's size and complexity. I'm not aware of a Z80 bank switching Basic version. The only way to access the extra 64K is through the use of Memdisk or by machine language.*

Q: I have a Model 4P. Can I hook it up to my Model I monitor?

A: Anything is possible if you know how. But you'd have to attack your computer with a soldering iron, a practice we discourage. You could cause damage, and you'd stand a good chance of raising the RFI (radio frequency interference) radiation beyond the limits the FCC allows. ■

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